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MARCH 1986
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MARCH 1986

VOLUME 2
NUMBER 6

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Ariolasoft goes wild

Soft In The Head

THERE'S A VERITABLE EPIDEMIC OF NEW software in the shops at the moment, so let's go on with the news straight away.

Remember the Alamo? Ariolasoft does. The latest game from this prolific software house is called Wild West and has all the traditional features of a classic John Wayne movie. Big Nose Bill and his boys have captured Fort Snake and you're the hero who has to liberate this outpost. On your quest you'll encounter such well-tried western hazards as a bank robber, a shoot-out with the sherrif and a wild stagecoach ride. It's for the C64 and is available on cassette (£9.95) or disk (£12.95).

If you'd prefer something a little more cultural, why not take a look at Global Software's Old Scores. It's an adventure set around London's South Bank arts complex and features The Dice Waltz (one of Mozart's little gems). There's also a voucher in each game which entitles the purchaser to a free guided tour backstage at the Royal Festival Hall.

Now on to a different track with the computer version of Scalextric from Leisure Genius. Produced under licence from Hornby Hobbies the game incorporates many of the features of the popular Scalextric sets. You can design your own tracks using straights, curves and chicanes and each player has a 3D view of the track ahead as well as a plan of the whole circuit. It's for the C64 and costs £9.95 on cassette.

Martech has also been looking around the toyshops to find an idea for its latest release. The game is called Zoidzilla and is based around Tomy's range of Zoids. You'll find yourself on Zoidstar in the middle of a war between Blue Zoids and Red Zoids, Zoidzilla, the blue leader, has been smashed into eight pieces all of which are scattered behind enemy lines. You're the unfortunate little Zoid who has to go and retreive them. Look out for Red Horn, leader of the enemy forces! Zoidzilla costs £8.95 on the C64.

Virgin has brought out a follow up to Now Games – appropriately called Now Games 2. This tape contains such popular

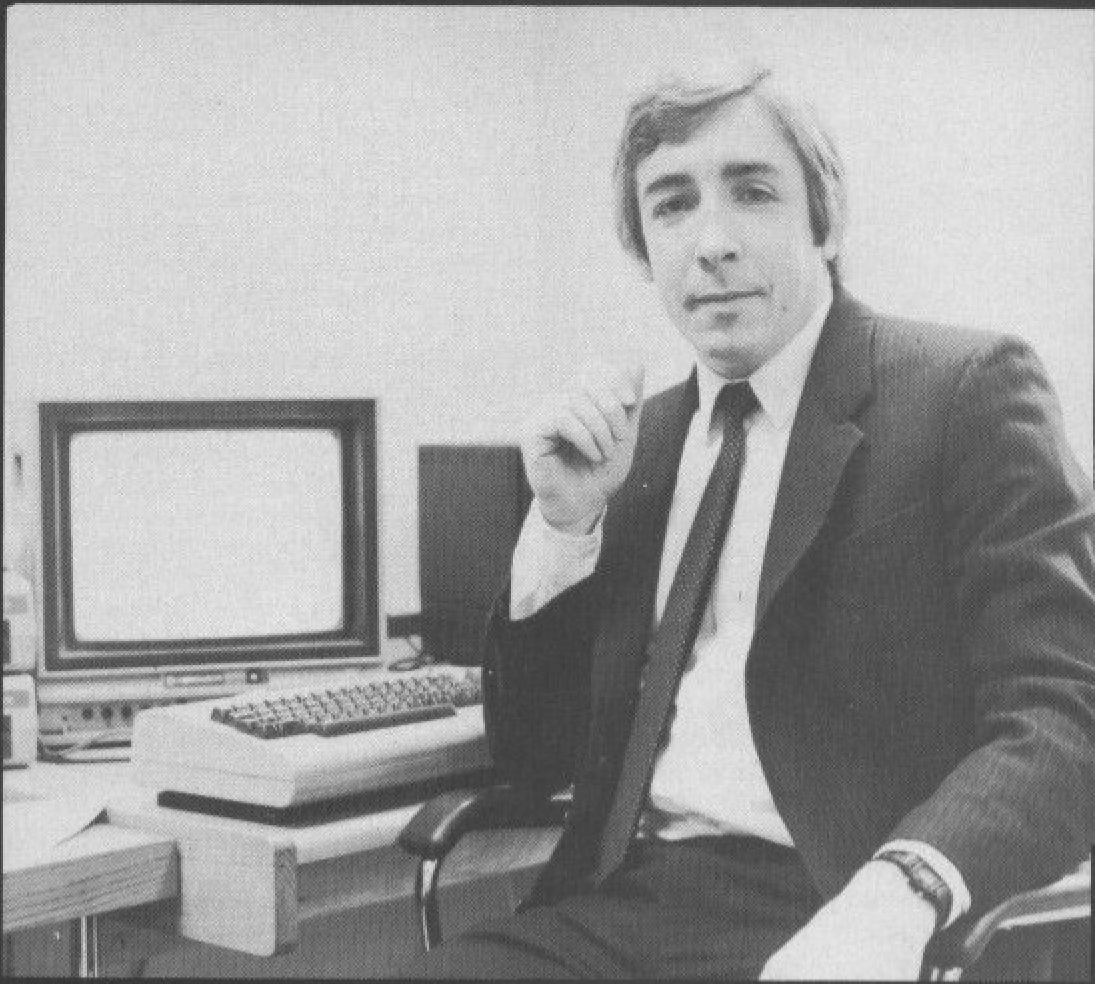
titles as Airwolf from Elite Systems, Tir Na Nog from Gargoyle Games, Cauldron from Palace Software, Chuckie Egg 2 from A&F and World Cup from Artic. You can get the lot for £8.95.

As reviewed in Your Commodore (February 1986), you can now purchase Rainbird's The Music System. According to Rainbird, there's nothing like it whether you're Heaven 17 or a two finger pianist it's out now on cassette (£14.95) and disk (£17.95).

If you're one of those people who's always talking about life, the universe and everything, then you'll be happy to know that you can now play The Hitchhikers guide to the galaxy in the safety of your home, courtesy of Softsel. This is only one of the games in a new range of Infocom Classic Titles. The other four are Zork 1, Seastalker, Planetfall and Deadline. The prices of the games have also been reduced so you can hitch around the Milky Way for a mere £24.95 or try any of the others for only £19.95.

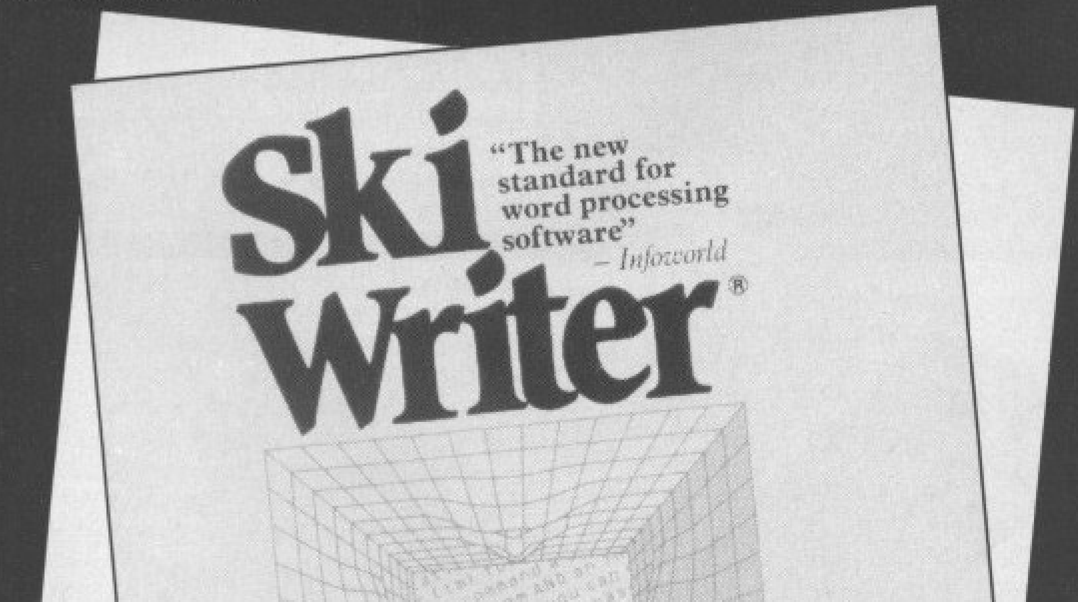
If you enjoyed Hewson Consultants Paradroid then you'll be pleased to here that a sequel is at this moment winging its inexorable way to your local shops. Named Uridium the game is a fast arcade style shoot-em-up. It will be available at the end of February and there is also a plot afoot to put both games on disk.

US Gold is still producing new titles like there's no tomorrow. And there's good news for C-16 and Plus/4 owners. For £7.95 you can now buy yourselves a copy of Beach Head.



Tony Rainbird makes music

Level 9 has added a third title to its Silicon Dream series – The Worm in Paradise. The two previous games in the trilogy were Snowball and Return to Eden. The Worm costs £9.95 for the C64.



Fed up with playing other peoples games? Perhaps Activision has the answer to your problem. You can now buy Gamemaker: The Computer Game Design Kit. Using a joystick you can select commands from a menu to produce and animate characters, draw backgrounds, create sound effects and compose musical scores. The cassette costs £9.99 and the disk version is £14.99 including a free blank disk to save your games on.

Supersoft has also come up with a helpful program for the creative bods among you. Flowcharter is a machine language program which will display or print a Basic program after it has been written. When something goes wrong with your latest program all you need to do is call up a flowchart and you'll be able to see what your program is doing. It's £12.95 on tape and £14.95 on disk and it's out now.

Mastertronic, the UK budget software house, has launched itself into the business world with a word processing package called Ski Writer. The package was originally released in the USA by Prentice Hall but now world rights have been jointly acquired by Mastertronic Limited (UK) and Mastertronic International Inc (USA). It's available on cassette and disk at £13.95 and £14.95 respectively. A special version for the C128 is on the cards and will be released shortly. It is hoped that it will use all the extra capabilities of the C128.

Back into space we go to look at CRL's latest game, the title of which is probably a

candidate for the most terrible pun of 1986 – Space Doubt. Loosely, the plot features the USS Omnibus, transporting a cargo of food to the hungry workers on Planet Niblondis. Of course you run into trouble but find out more by spending £7.95.

Time to spin off to the fairground and have a look at an offering from Interceptor Micros. Wild Ride, a new arcade game for the C64, features a crazed bomber intent on destroying the rollercoaster in an amusement park. Luckily, you – in your alternative persona of a clown – are available to run along the tracks and detonate the bombs. If you want to endanger you life and your circus career, it will cost you £6.95.

Touch Line

Wild West: Ariolasoft, Suite 105/6, Asphalt House, Palace St, London SW1E 5HS. (01 834 8507) Price: £12.95 disk, £9.95 cassette.
Old Scores: Global Software, PO Box 67, London SW11 1BS (01 228 1360).
Scalextrix: Leisure Genius, 3 Montague Row, London W1H 1AB (01 935 4622). Price: £5.95.
Zoidzilla: Martech, Martech House, Bay Terrace, Pevensey Bay, E Sussex BN24 6EE (0323 7684456). Price: £8.95.
Now Games 2: Virgin Games, 2-4 Vernon Yard, Portobello Rd, London W11 2DX (01 727 8070). Price: £8.95.
The Music System: Rainbird, Wellington House, Upper St Martin's Lane, London WC2H 9DL (01 240 8838). Price: £14.95 cassette, £17.95 disk.
Infocom Classics: Softsel, Burgess and Co., 69 High St, Maidenhead, Berks SL6 1JX (0628 72727). Price: Hitchhiker's Guide £24.95, others £19.95.
Uridium: Hewson Consultants, 56B Milton Trading Estate, Milton, Abingdon, Oxon (0235 832939).
Beach Head: US Gold, Unit 10, The Parkway Industrial Estate, Heneage St, Birmingham. B7 4LY (021 359 3020). Price: £7.95.
The Worm in Paradise: Level 9, 222 Hughenden Rd, High Wycombe, Bucks HP13 5PG (0494 26871). Price: £9.95.
Gamemaker: Activision, 15 Harley House, Marylebone Rd, London NW1 (01 935 1428). Price: £14.99 disk, £9.99 cassette.
Flowcharter: Supersoft, Winchester House, Canning Rd, Wealdstone, Harrow, Middx HA3 7SH (/1 861 1166). Price: £12.95 cassette, £14.95 disk.
Ski Writer: Mastertronic, Park Lorne, 111 Park Rd, London NW8 7JL (01 377 6880). Price £14.95 disk, £13.95 cassette.
Space Doubt: CRL, CRL House, 9 Kings Yard, Carpenters Rd, London E15 2HD (01 533 2918). Price: £7.95.
Wild Ride: Interceptor Micros, Lindon House, The Green, Tadley, Hants (Tadley 71145/3711). Price: £6.95.

Hard Lines

ARE YOU ONE OF THOSE PEOPLE WITH a Commodore PET tucked awy in a cupboard? Now, thanks to Supersoft, it could be in for a new lease of life. The Supersoft RAM PLUS boards allow any machine to be upgraded to a full 32K – the most that Basic will recognise. For £35 the RAM PLUS 16 will upgrade a 16K PET and the RAM PLUS 24 upgrades any large keyboard machine from 8K to 32K at a cost of £60.

The oldest 8K PETs with calculator style keys and built-in cassette decks are also catered for. They need a special board, the RAM PLUS 245 which is also priced at £60.

Not satisfied with this, Supersoft has also produced the BASIC 2+4 Board which allows any 40 column PET to run both Basic 2 and Basic 4. And, lastly, there's the RAM/ROM board, a ROM/EPROM emulator with 8K of battery backed up RAM. Both of these are £65.

If you have ever experienced supply problems caused by interference transmitted via the mains supply, then you may be interested in Conblock electrical's Smoothline Connector.

The unit provides four filtered outlets (each rated at six amps maximum) from one 13 amps mains socket. It comes complete with a mains lead and plug and is fitted with four miniature plugs for wiring to the computer equipment.

Interference can be caused by other home appliances being switched on or off either manually or automatically. This can result in data being corrupted. According to Conblock, Smoothline is the first serious attempt to eliminate these problems.

Duraplug Electricals is also trying to minimise your home computing problems with the latest version of its four way socket outlets. The new Duraline range comprises two models: the non-fused 4135 and the fused 4136. New features include a rocker on/off switch, a neon mains on indicator and a removable terminal cover for easy wiring. They cost around £10 and are available from electrical stores.

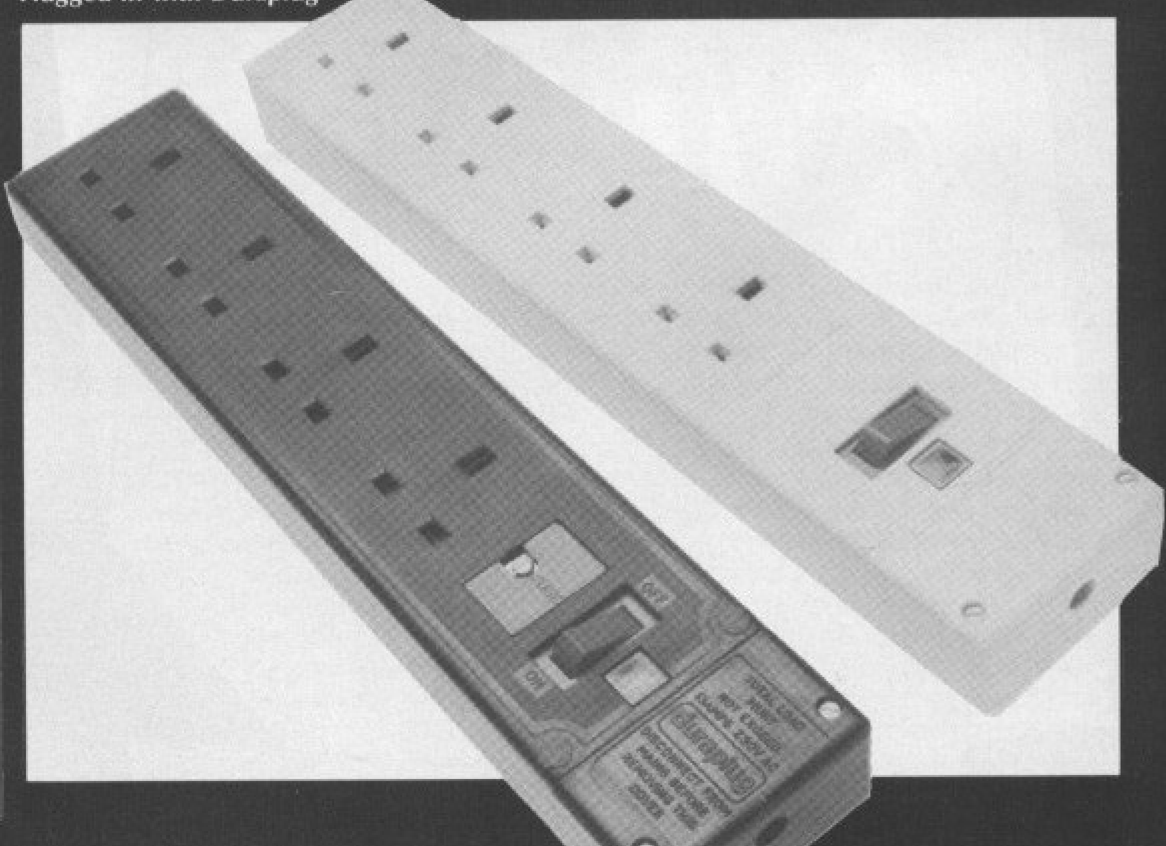
Trilogic is launching itself into the C128 hardware market with its Vidcon 1, 2 and 3 products. The Vidcon 1 allows any monitor or TV to display the 80 column output of the C128 in any of the 16 available colours. It costs £59.95. The Vidcon 2 (£49.95) is similar but cannot be used with a standard TV and the Vidcon 3 is a monochrome version of Vidcon 1 and costs £29.95.

Robcom – now renamed Robotek – has also started catering for the C128 user. Two new products have recently been launched. The first allows you to use both 40 and 80 columns on a C128 on a normal composite monitor. The second is an asset for avid games players. Game Killer turns off sprite protection so that you can't be killed in any game you play. Both retail at £14.95.

Touch Line

PET Upgrade Boards: Supersoft, Winchester House, Canning Rd, Wealdstone, Harrow, Middx HA3 7SJ (01 861 1166).
Smoothline: Conblock Electrical, Mochdre Industrial Estate, Newtown, Powys SY16 4LF (0686 27100).
Duraplug Electricals: Westwood Works, Margate Rd, Broadstairs, Kent (0483 68771).
Vidcon: Trilogic, 29 Holme Lane, Bradford, BD4 0QA (0274 685926).

Plugged in with Duraplug





Software aid for Leukaemia sufferers

Generally Speaking

CITIZEN EUROPE, MAKERS OF DOT matrix printers, have been awarded the G-Mark design award for a new range of MSP printers. The G-Mark is the Japanese equivalent of the British Design Council awards.

Citizen Europe also made itself very popular with Ian Botham by donating £2000 to the Leukaemia Research Fund, the beneficiary of Ian's marathon John O'Groats to Lands End walk.

If you've ever wanted to go to America, perhaps you should go out and buy a copy of Quicksilva's Flintstone's program – Yabba Dabba Doo. Quicksilva is running a competition in conjunction with WH SMith and TWA and the prize is two tickets to Los Angeles, a chance to visit the Hanna Barbara studios and a trip to Disneyland.

The game is on sale now at £7.95 and you're eligible for the competition if you buy a copy.

Ultimate has decided to stop going it alone and has handed over control of manufacturing, marketing, promotion and sales of all its products to US Gold.

Ultimate will now be leaving this side of the business alone so that its team can concentrate solely on developing new products.

In Touch

MICRONET HAS LAUNCHED A MULTI-user game as a rival to British Telecom's MUD. The game is an adventure called Starnet and allows 500 people to play simultaneously. Its a space adventurer in which you can form alliances and attack your fellow players in an attempt to become the one who finally controls the 3000 stars in the galaxy.
Contact Micronet *800030 for more details.

Micronet also helped out on the BBC's Children in Need appeal by holding an on-line celebrity chatline with the stars at the BBC studios on the night of the Telethon. For a small fee Micronet members could ask any questions they liked of stars such as Selina Scott, Paul Nicholas and Patrick Moore. Along with the proceeds from an auction of software and hardware Micronet was able to donate well over £5000.

If you're thinking of buying a modem, perhaps you should take a look at the WS200 modem from Miracle. The company has just cut the price by more than £20. The modem now costs £125 instead of £149.44.

Touch Line

Micronet 800, 8 Herbal Hill, London EC1R 5EJ (01 278 3143).
Miracle Technology, St Peters St, Ipswich IP1 1XB.

C128 Winners

WE HAD A MARVELLOUS RESPONSE TO our 128 competition, but unfortunately many people will have to be disappointed as we've only got five computers to give away. So well done to the following five people and commiserations to the rest.

The winners are: Matthew Seddopn, Acomb, York: D J Causton, Wickford, Essex: Paul Knowles, Finchley, London: Mark Walland, Upminster, Essex: William Hicks, Meiford, Powys.

Congratulations

WE'VE BEEN REALLY BUSY MARKING competitions so here's a list of the lucky winners, starting with our Modem competition which appeared in our November 1985 issue. The 10 winners are: Philip Costa, Southgate: Shane Sharp, Harlow: Dave Parish, West Wickham: M T Robinson, Nottingham: K J Knight, Seaford: Barry Deri, Huyton: Richard Vass, Whimple: John Philip Timperley, Lancaster: Chris Matson, Boston: David Barlow, Derby.

In October we ran a Wizard Development competition, and the following 30 people will each receive a copy of William Wobbler: Andrew Staff, Muswell Hill: J Bassett, Saltash: C De Haan, Rotterdam: Rachel Fox, Abertilley: D Constable, Sharnbrook: David Knight, Fareham: H Dawkes, Leamington Spa: Shane Stevens, Chippenham: Derek Martin, Erith: D Eaborn, Southampton: D Ovenden, Wellingborough: Richard Sirr, Drumcliffe, Co. Sligo: C Croser, Eastkilbride: Scott Binnington, Slough: Ashaq Khan, High Wycombe: Jeff Bork, Schwedelback, W Germany: Raui Kumar Kalsy, Leeds: C J Matla, Gendringen, Netherlands: J M Fryer, Rotherham: J Lomax, Wallasey: Timothy Davies, Cardiff: D Balcombe, Maldon: Jeremy Swift, Lewes: Stephen Darnell, Swansea: A Jackson, Hull: Simon waites, Kilburn: James Trusler, Shoreham-by-Sea: P Fisher, Didcot: Garth Muirhead, Redhill: Gavin Dickson, Newtownards, Co. Down.

In December 1985 we ran a US Gold adventure competition and the following 10 people will each get a set of US Gold adventures: Michael Valadez, Brandon: C W Skelton, T M Troop, 13 Signal Regt: P T Wheeler, Crawley: Devji Vekaria, Kingsbury: D A Nutting, Weston-Super-Mare: Iain Pilcher, Raynes Park: A P Roberts, Bournemouth: Kimberley J Ross, N Y 09355: Jonathan Seymour, Methley: John Wright, Stoke-on-Trent.

Easy Entry Revisited

SOME C64s SEEM TO BE HAVING A PROblem with our Easy Entry program. However we've now found a way to solve this, so if you've had difficulty using the program, try adding the following line and it should sort things out for you.

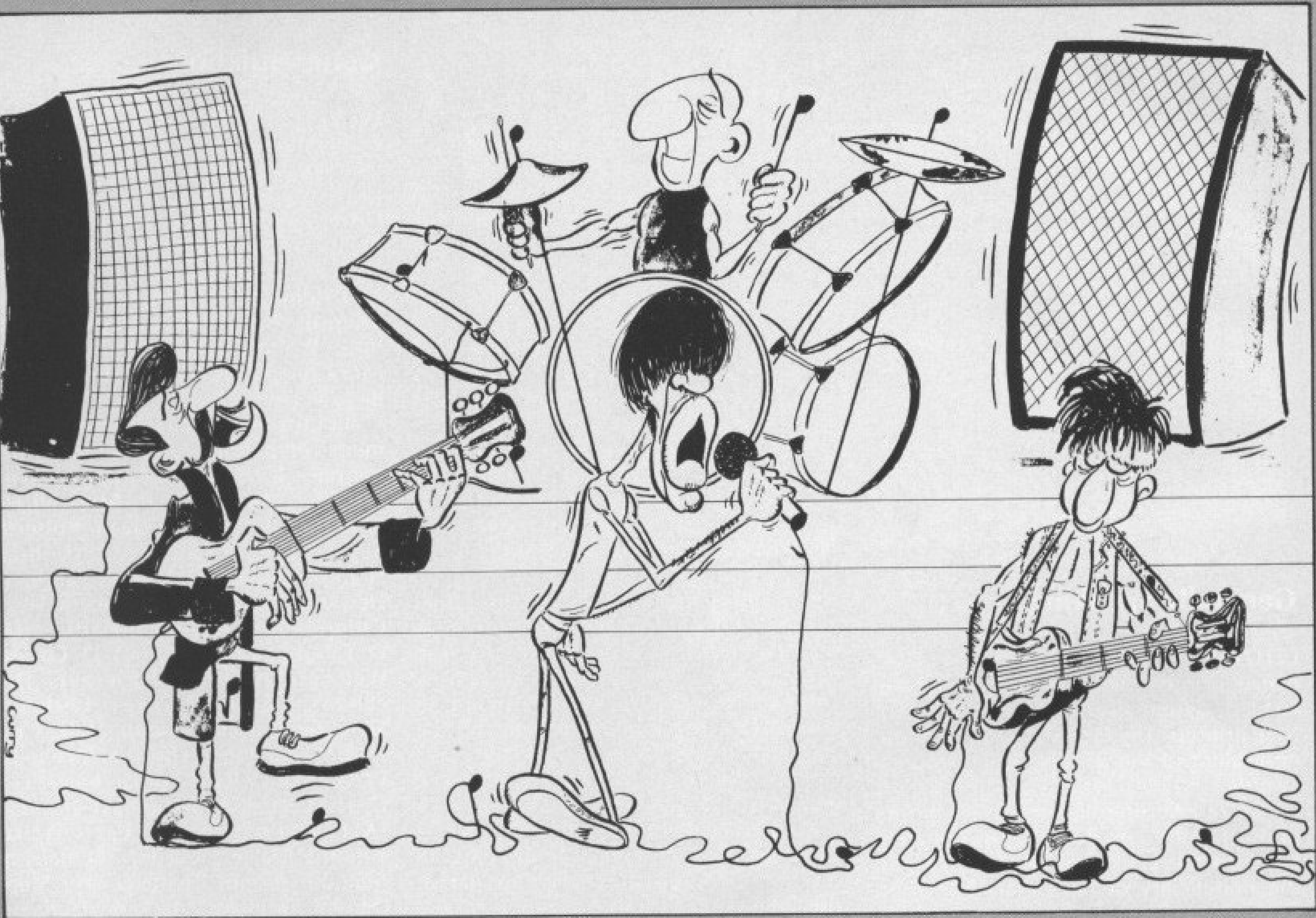
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225 G = FRE(Ø)
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Make your party go with a swing with our great prize from Wizard Development.

THIS MONTH WE'VE GOT A PRIZE which will get your feet tapping and your hands clapping.

We got together with our friends a Wizard development and we can offer a personal hi-fi to the reader who's first out of the bag in our really easy competition.

There's a musical theme to it, of course, but it shouldn't give anyone any problems, so get your pen out and read on to find out what to do.



How to Enter

Study the picture on this page. There are several musical notes hidden in the cartoon. All you need to do is circle them clearly and send the entry coupon to us. Don't forget to complete the tiebreaker sentence or your entry will be disqualified. Please use no more than 15 words.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications and Wizard Development. This restriction also applies to employees' families and agents of the company.

The How to Enter section forms part of the rules. The editor's decision is final and no correspondence will be entered into.

WIZARD COMPETITION
ENTRY COUPON

Name. . . . .

Address . . . .

. . . .

. . . . .Post code. . . . .

Number of musical notes found . . . .

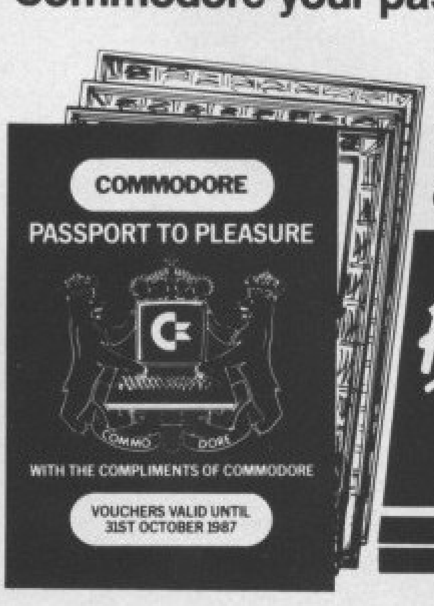
Send your entry to: Wizard Competition, Your Commodore, 1 Golden Square, London W1R 3AB.
Closing date: Monday 31 March 1986.
Write clearly and fully and do not forget to write your answer on the back of your envelope.

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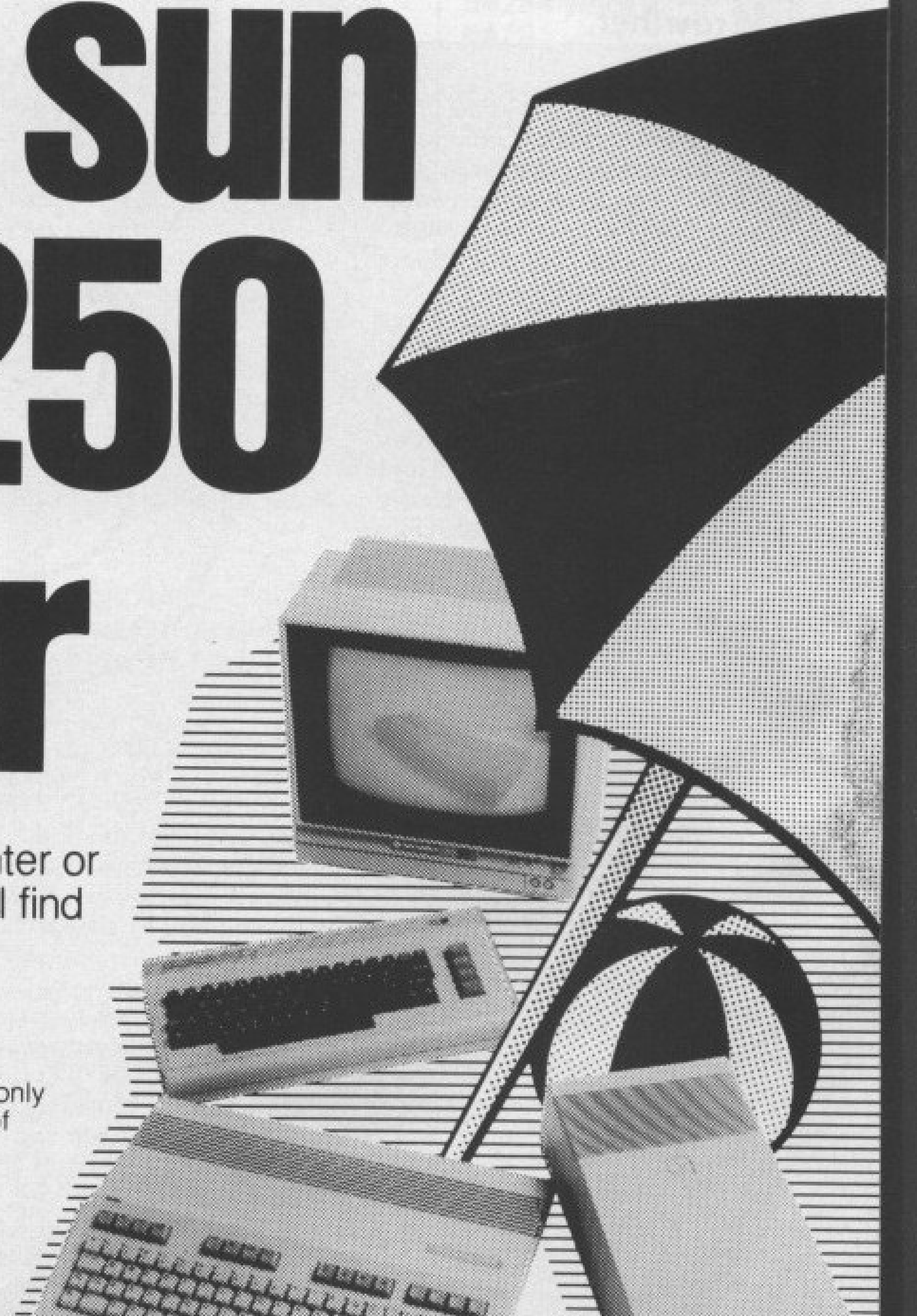
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Music Master

More music from your C64 with this superb program from Tony Crowther.

IF YOU WOULD LIKE TO become a budding composer or simply get your C64 to play music as good as that on commercial games then Music Master is what you need. In fact I have used this program, and some earlier versions, to enter music into many of my own programs, so that should give you an idea of its versatility.

The main differences between Music Master and many of the other 'Music Editor' programs – available either through magazines or commercially – are that:

1) Music is entered in the form of easy to understand DATA statements.

2) Music to be played is stored in memory as code and a machine code play routine will play the music without interfering with other programs.

You may think that a program which has to read music from DATA statements would be very slow but that's not so. Music Master will read around 200 musical statements per second and set it up in memory ready to be played by the routine mentioned in 2) above. Another important fact to remember is that, once the music has been transferred from DATA statements into memory, you can save the block of music to disk or tape using a machine code monitor and you will not have to go through the DATA statements again. But more of this later.

Program Format

As I've already mentioned, all music is entered in the form of DATA statements. The DATA statements are broken into three sections: Data for Voice one, Data for Voice two and Data for Voice three. Music Master expects to find the music data for each of the C64's available voices at the following lines:

3000 DATA for voice one.
5000 DATA for voice two.
7000 DATA for voice three.

In order that Music Master knows where each voice finishes, each should end with a special number. These are, -1, -2, -3 for voices 1, 2 and 3 respectively. When working with Music Master, I usually set up the program as follows so that I don't forget the '-' number. If you do then the program would probably stop working.

```
3000 DATA. voice 1 data.
4999 DATA-1
5000 DATA.voice 2 data.
6999 DATA-2
7000 DATA. voice 3 data.
8999 DATA-3
```

NOTE. As in the above illustration you must not put any spaces after the word DATA. If you do then the program will not work properly.

Available Commands

A large number of commands are available with Music Master. Each one will effect certain registers in the SID chip. This is the device that allows your C64 to play music. Normally you would have to POKE values into certain registers of the SID chip but Music Master will do this for you, and do it very quickly. It is therefore possible to change parameters while music is playing. Figure 1 lists the available commands and the registers which they effect.

I will now explain the available commands.

Tempo

'-T' is the command used to set the speed at which music is played. After the '-T' there are three digits which indicate the speed, these range from 001 to 255. For example '-T003' would set the tempo to three. There must always be three digits after the '-T'.

The more technical amongst you may be interested to note that a value of '-T001' would cause a note to be played every 1/50th of a second. A speed of -T002 would therefore cause a note to be played every 1/25th of a second. Memory location 53247 is a fine tune for the speed. It is normally set to 255 but POKEing it with different values will speed the tempo of the music up.

Volume

'-4' is used to set the overall volume of the music. This can

range from 000 to 015. The command -4015 sets the volume to maximum. If you were to use numbers greater than 0015 then you would start to bring in some of the SID chip filters. This is because the register which is altered by this command is also used to hold filter information. I'll deal with filters in more detail later.

Waveform

Each voice must have a wave form set for it. The following commands are used to choose the type of wave for each voice:

-6000 – No sound
-6017 – Triangle
-6033 – Sawtooth
-6065 – Pulse
-6081 – Triangle and pulse
-6129 – White Noise

When you are using the pulse waveform then the pulse width must be set. Two commands are used to do this – '-7' and '-8'. Again three digits must be entered after each number. Use '-7' to set the high byte of the pulse width and '-8' to set the low byte. The commands have the following ranges:

-7000 to -7015 (high byte).
-800 to -8255 (low byte).

Command	Limits	Action	Locations Altered
–1	N/A	Marks end of voice 1	N/A
–2	N/A	Marks end of voice 2	N/A
–3	N/A	Marks end of voice 3	N/A
–4	000-255	Sets Volume and Filters	54296
–5	000-255	Attack/Decay for each voice	54277 voice 1
			54284 voice 2
			54291 voice 3
–6		Set waveform for each voice	
	000	No Sound	54276 voice 1
	017	Triangle	54283 voice 2
	033	Sawtooth	54290 voice 3
	065	Pulse	
	081	Pulse/triangle mixed	
	129	White Noise	
–7	000-015	Pulse width High Byte	54275 voice 1
			54282 voice 2
			54289 voice 3
–8	000-255	Pulse width Low Byte	54274 voice 1
			54281 voice 2
			54288 voice 3
–9	000-255	Sustain/Release for each voice	54278 voice 1
			54285 voice 2
			54292 voice 3
–H	000-255	Filter Resonance	54295
–J	000-007	Filter Cut Off Low Byte	54293
–K	000-255	Filter Cut Off High Byte	54294
–T	000-255	Tempo	N/A
–W	1	Oscillator On	54299
	0	Oscillator Off	54299
–X	1	Oscillate Pulse On	54300
	0	Oscillate Pulse Off	54300
–Y		Change wave while playing	
	1	Pulse	
	2	Sawtooth	
	3	Triangle	
	4	White Noise	
	0	Off	

Figure 1

Envelopes

Not only must you set the waveform type for each voice but you must also set the envelope. The envelope is more commonly known as the ADSR or Attack, Decay, Sustain and Release. The command —5xyz is used to set the attack and decay while the command -9xyz is used to set the sustain and release. These two commands alter the usual bit patterns associated with the ADSR settings. Each of the parameters can have a value between zero and 15. However since each command operates on two parameters the actual numbers to use are a little complicated to work out.

Firstly you will need to find the corresponding value of a parameter in binary. For example, a setting of 15 would have the binary pattern 1111 and one of nine would have the pattern 1001.

Now let's take a look at the '-5' command in more detail. If we were to break down the number following the '-5' into binary then the number would have eight 1s i.e. 11111111. The first four 1s represent the Attack and the last four the decay. If we therefore wanted an attack of 15 and a decay of nine the number would have the following form:

11111001

Now we can convert this number to decimal as each 1 has an equivalent decimal number depending on its position. This involves adding these numbers up to find the number that has to follow the -5. Each position has the following values:

ATTACK				DECAY			
128	64	32	16	8	4	2	1

Therefore an attack of 15 and decay of nine would have a value of:

128+64+32+16+8+1 or 249

Don't forget though that if the number is less than 100 it must still have three digits.

As mentioned before the command '-9' is used to set the sustain and release. This is worked out as for the '-5' command; the first four 1s are

the sustain and the lower four are the release. For example a sustain of 3 and release of 5 would have the following patterns:

0011 0101 in binary or
32+16+4+1 = 53 in decimal.

Therefore the command would be -9053.

This may sound complicated but once you start to use the commands you will soon find it very easy to work out the values to follow them.

Special Effects

A number of special effects are available with Music Master, these help to make the notes played sound a little more interesting.

Oscillators

'-W' will oscillate any notes being played. To use this command enter:

-W1 to turn it on and
-W0 to turn it off.

'-X' will alter the pulse width of any notes being played that have a pulse waveform. The format for the command is:

-X1 on
-X0 off

'-Y' is a rather special command as it will alter the waveform of any notes while they are playing. This allows for some very interesting effects. The command has the following formats.

-Y1 change to Pulse while playing
-Y2 change to Sawtooth
-Y3 change to Triangle
-Y4 change to Noise
-Y0 turn command off.

Filters

As mentioned earlier, it is possible to alter the filter settings of the SID chip with the '-4' command. I'm afraid that we will have to go back to using binary again to show you how this command works. First let's have a look at what each does.

CUT OFF V2	Hi-pass	Band-pass	Lo-pass	Volume
128	64	32	16	8 4 2 1

From the above table you should be able to see why the volume can only go up to 15. As an example, let's set a band pass filter with a volume of three. The binary pattern for this would be:

00100011

If you refer to the above table you will see that this is 36 so the command to set up the values would be

4036.

'-Jxyz' is used to set the filter cut off frequency low byte. This has a range from 000 to 007.

'-Kxyz' is used to set the high byte of the Cut off frequency and has a range from 000 to 255.

'-H' is used to set the filter resonance and again requires you to use binary numbers. The number has the following format:

Resonance	External	Voice2	Voice3	Voice1
128 64 32 16	8	4	2	1

Look It Up

Many of the above commands seem very complicated. Obviously we can't go into how to use the SID chip in this article as it would take a whole series. If however you wish to take a closer look at exactly what the above commands do then take a look in the C64 user guide and the Reference guide.

Note Format

Notes are extremely easy to enter into the data. Each note takes the form 'Octave Note Length'.

The Octave ranges from zero to seven. Zero is the lowest.

The Note has the corresponding letter i.e. A B D C E F and G.

Length is between zero and 99 and is the duration of time that the note plays.

In order to double the length of a note it is necessary to double the duration i.e. a note length four is twice as long as a note of length two and half as long as a note of length eight.

If you want to work in musical terms I usually find it best to give a crotchet a length of eight. This means that a quaver has a length of four and a minim has a length of 16. If you require a dotted note then the length of this is half way between complete notes. Therefore if a crotchet is length eight then a dotted crotchet has a length of 12 i.e. halfway between eight and 16. Figure 2 should make this a little clearer. Figure 3 shows which notes correspond to which octave.

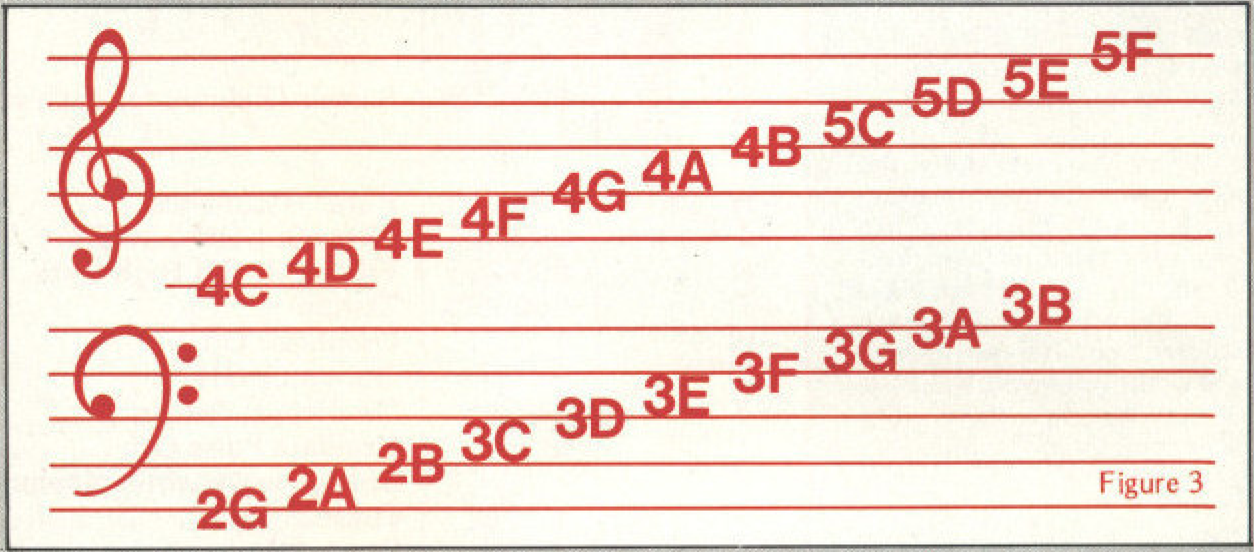


Figure 3

Sharps and Flats

If you wish to use sharps then you prefix the note name with a '#' sign e.g. 4 C8. Flats are not needed as a flat always has an equivalent sharp. For example B flat is the same as A sharp.

Rests

If you want to put rests into any voice then you must use 0Rlength e.g. 0R8.

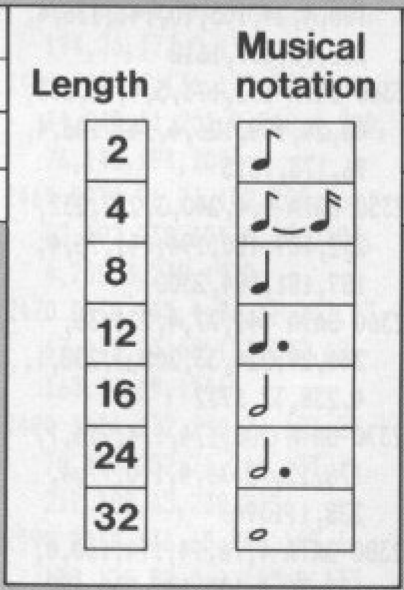


Figure 2

Layout

Now that we have covered all of the available commands we can get down to writing some music.

As I have previously mentioned, the music data is broken into three sections. Before we enter any musical data into any section some items must be set to their default values. If you keep to the following rules then you should have no problems. Let's take each important line in turn

Line 3000 should always have the following form:

3000 DATA-4xyz, -Txyz, -Hxyz, -Jxyz, -Kxyz

where xyz is a three digit number. This line sets up the initial Volume, Tempo and Filter settings. If you are not using any filters then xyz for -H, -J and -K should be 000. Do **not** miss this out or you could get some strange results.

Lines 3001, 5000 and 7000 should take the following form:

3001 DATA-6xyz, -5xyz, -9xyz, -7xyz

This will set up the Waveform and ADSR for each voice. The '-7' command should only be added if you are using the pulse waveform.

If any voices are not being used then they should be either be padded with rests or their waveforms padded out with rests.

N.B. Music will repeat as soon as Voice 1 has finished playing.

Examining Example 1 should make things a little clearer. Voices 2 and three are not used at all and Voice 1 plays a simple musical Scale.

Playing Music

Once you have entered all the music, make sure you save it before attempting to play it. If you don't and you have entered something wrong then you could lose your work.

Before running any music, Music Master should be loaded into memory with

LOAD "MUSIC MASTER",8 for disk or ,1 for tape.

Music Master can be in memory while you are entering a program as it will not conflict with any Basic program.

Then make sure that your Music Data is loaded and type:

SYS 49152

This will cause the music data to be read into memory from location 25600 onwards.

To play the music you simply have to enter the command:

SYS 52000

the music will then start playing until you stop it with RUN/STOP and RESTORE.

The SYS 49152 and SYS 52000 can be part of any normal Basic program as long as you don't use any lines that are needed by the music data.

Once the music data has been moved into memory the Basic Data is no longer needed so you could even load in other programs and the music will continue as long as the other program doesn't use the same memory or redirect the interrupts.

Once the music data is in memory it is a simple matter to SAVE the DATA and the Running program with a machine code monitor. The Running program lies from location 52000 to location 53244.

The Music data starts at location 25600 and the length can be found by entering the following line if the Basic Data is present.

FORI=0TO99999:READ A$: NEXT

When the program returns with an 'Out of Data' error then type:

PRINT I*3

the result is the length of the data in memory.

Playing Around

One small feature of Music Master is an in-built 'Organ'. Simply POKE location 5076 with the Octave in which you want to play and type:

SYS 49890

A picture of a keyboard will appear on screen and by pressing the keys indicated you will be able to play music.

Getting It All In

There are three parts to Music Master. MASTER LOAD is a loader for the program which displays a reminder of the instructions. MASTER DATA1 and MASTER DATA2 are used to enter the machine code for Music Master into your machine.

Type in and SAVE all three programs separately. If using cassette then SAVE MASTER LOAD on a separate cassette to the other two programs.

Once all programs have been entered and SAVEd, LOAD in MASTER DATA1 and RUN. Once the program has finished LOAD MASTER DATA2 and RUN. If you are using cassette place the cassette containing MASTER LOAD in the data recorder and make sure that it is positioned at the end of this program. Now type in the following:

POKE43,00 :POKE44,192 :POKE45,00 :POKE46,208

Now type:

SAVE "MUSIC MASTER",8,1 for disk or
SAVE "MUSIC MASTER",1,1 for tape.

You should now have a working version of the program and should only need to LOAD 'MASTER LOAD' whenever you want to use the program in future.

PROGRAM: MASTER LOAD

```
10 PRINT"[CLEAR,C7,SPC4]
   MUSIC MASTER :BY TONY CRO
   WTHER
11 PRINT"[DOWN,SPC2]
   (C) WIZARD DEVELOPMENT
   COMPANY LTD.
13 PRINT"[DOWN]SYS 49152
   : READ DATA STATMENTS
14 PRINT"SYS 52000
   : PLAY MUSIC
15 PRINT"[DOWN]COMMANDS"
16 PRINT"[DOWN]-T000 = TEMPO
   [SPC5]-4000 = VOL+FILT
   TYPE
17 PRINT"-5000 = ATT/DEC
   [SPC3]-6000 = WAVE
18 PRINT"-7000 = PULSE HI
   [SPC2]-8000 = PULSE LOW
19 PRINT"-9000 = SUS/REL
   [SPC3]-J000 = FILT LOW
20 PRINT"-K000 = FILT HI
   [SPC3]-H000 = FILT VOIC+R
   ES
21 PRINT"[DOWN]-W1 = OSCILLA
   TE LOW BYTE OF PULSE
22 PRINT"-X1 = OSCILLATE NOT
   E"
23 PRINT"-Z1 = SLIDE DOWN!
24 PRINT"[BLACK]CHANGE WAVE
   WHILE PLAYING NOTE
25 PRINT"[C7]-Y1 = TO PULSE
   [SPC5]-Y2 = TO SAWTOTOOTH
26 PRINT"-Y3 = TO TRIANGLE
   [SPC2]-Y4 = TO NOISE
27 PRINT"-Y0,-X0,-W0,-Z0 =
   OFF!"
30 LOAD "MUSIC MASTER",8,1
   :REM CHANGE TO ,1,1 FOR
   CASSETTE
```

PROGRAM: MASTER DATA1

```
2000 FOR L=0 TO 83:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 49152+L*16+
   D,A:NEXT D
2010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2040+(L*10):STOP
2020 NEXT L:END
2040 DATA 169,0,141,104,4,
   141,105,4,165,43,133,170,
   165,44,133,171,1692
2050 DATA 160,2,177,170,201,
   184,208,10,200,177,170,
   201,11,208,3,76,2158
2060 DATA 53,192,32,40,192,
   76,16,192,160,0,177,170,
   170,200,177,170,2017
2070 DATA 133,171,134,170,96,
   169,100,133,173,169,4,133,
   172,160,4,177,2098
2080 DATA 170,200,201,131,
   240,13,201,0,240,3,76,63,
   192,32,40,192,1994
2090 DATA 76,61,192,162,0,
   138,157,0,4,232,224,9,208,
   248,162,0,1873
2100 DATA 177,170,157,1,4,
   232,200,201,44,240,7,201,
   0,240,3,76,1953
2110 DATA 96,192,140,0,4,173,
   1,4,56,233,48,141,1,4,169,
   0,1262
2120 DATA 141,9,4,173,2,4,
   201,35,208,6,238,9,4,173,
   3,4,1214
2130 DATA 141,10,4,162,0,189,
   179,194,205,10,4,208,3,76,
   239,193,1817
2140 DATA 232,224,39,144,240,
   173,1,4,201,253,208,37,
   173,2,4,201,2136
2150 DATA 49,208,13,165,172,
   141,2,100,165,173,141,3,
   100,76,77,192,1777
2160 DATA 201,50,208,16,165,
   172,141,0,100,165,173,141,
   1,100,76,77,1786
2170 DATA 192,238,33,208,201,
   51,208,1,96,201,52,208,24,
   32,162,193,2100
2180 DATA 169,1,160,0,145,
   172,200,145,172,200,12,
   167,194,173,126,4,2040
2190 DATA 145,172,76,129,194,
   201,53,208,8,32,162,193,
   169,2,76,226,2046
2200 DATA 192,201,54,208,8,
   32,162,193,169,3,76,226,
   192,201,55,208,2180
2210 DATA 8,32,162,193,169,4,
   76,226,192,201,56,208,8,
   32,162,193,1922
2220 DATA 169,9,76,226,192,
   201,57,208,8,32,162,193,
   169,10,76,226,2014
2230 DATA 192,201,72,208,8,
   32,162,193,169,11,76,226,
   192,201,74,208,2225
2240 DATA 8,32,162,193,169,
   12,76,226,192,201,75,208,
   8,32,162,193,1949
2250 DATA 169,12,76,226,192,
   201,84,208,8,32,162,193,
   169,14,76,226,2048
2260 DATA 192,201,87,208,8,
   32,145,193,169,5,76,226,
   192,201,88,208,2231
2270 DATA 8,32,145,193,169,6,
   76,226,192,201,89,208,8,
   32,145,193,1923
2280 DATA 169,7,76,226,192,
   201,90,208,8,32,145,193,
   169,8,76,226,2026
2290 DATA 192,173,3,4,56,233,
   48,141,126,4,96,238,33,
   208,238,32,1825
2300 DATA 208,96,169,0,141,
   126,4,173,3,4,56,233,48,
   141,127,4,1533
2310 DATA 162,0,236,127,4,
   240,13,173,126,4,24,105,
   100,141,126,4,1585
2320 DATA 232,76,178,193,173,
   4,4,56,233,48,141,127,4,
   162,0,236,1867
2330 DATA 127,4,240,13,173,
   126,4,24,105,10,141,126,4,
   232,76,207,1612
2340 DATA 193,173,5,4,56,233,
   48,24,109,126,4,141,126,4,
   96,173,1515
2350 DATA 9,4,240,3,232,232,
   232,189,180,194,141,76,4,
   189,181,194,2300
2360 DATA 141,77,4,224,36,
   240,29,224,33,208,3,238,1,
   4,238,32,1732
2370 DATA 208,174,1,4,224,7,
   176,12,78,76,4,110,77,4,
   238,1,1394
2380 DATA 4,76,14,194,160,0,
   185,76,4,145,172,200,192,
   2,208,246,1878
2390 DATA 173,3,4,201,48,144,
   4,201,64,144,12,173,4,4,
   141,3,1323
2400 DATA 4,173,5,4,141,4,4,
   173,4,4,201,45,176,9,173,
   3,1123
2410 DATA 4,56,233,48,76,125,
   194,173,3,4,56,233,48,141,
   3,4,1401
2420 DATA 173,4,4,56,233,48,
   141,4,4,169,0,174,3,4,224,
   0,1241
2430 DATA 240,7,24,105,10,
   202,76,110,194,24,109,4,4,
   160,2,145,1416
```

PROGRAM: MASTER DATA2

```
2000 FOR L=0 TO 69:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 52000+L*16+
   D,A:NEXT D
2010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2040+(L*10):STOP
2020 NEXT L:END
2040 DATA 120,169,255,141,
   255,207,169,90,141,20,3,
   169,203,141,21,3,2107
2050 DATA 169,0,141,24,212,
   141,14,220,169,1,141,26,
   208,141,25,208,1840
2060 DATA 169,60,141,18,208,
   32,148,204,169,27,141,17,
   208,88,162,0,1792
2070 DATA 138,157,112,206,
   232,224,25,144,248,96,169,
   1,141,25,208,162,2288
2080 DATA 0,181,170,157,102,
   206,232,224,10,144,246,32,
   138,203,173,49,2267
2090 DATA 206,24,109,255,207,
   141,49,206,141,18,208,162,
   0,189,102,206,2223
2100 DATA 149,170,232,224,10,
   144,246,76,49,234,12,13,
   205,32,174,203,2173
2110 DATA 162,0,32,69,205,
   232,224,3,144,248,238,74,
   206,173,74,206,2290
2120 DATA 205,73,206,144,8,
   32,53,204,169,0,141,74,
   206,96,173,133,1917
2130 DATA 206,24,105,1,11,1,
   141,133,206,162,0,189,115,
   206,240,14,1754
2140 DATA 173,133,206,208,6,
   32,96,207,76,206,203,32,
   40,204,189,118,2129
2150 DATA 206,240,19,173,133,
   206,4,0,32,65,206,240,9,
   32,69,207,1841
2160 DATA 12,230,203,32,40,
   204,189,117,206,240,23,32,
   13,205,76,2,1824
2170 DATA 204,65,0,0,12,0,0,
   12,0,65,12,0,0,12,0,0,382
2180 DATA 4,0,189,116,206,
   240,23,32,65,206,240,18,
   189,96,206,24,1854
2190 DATA 105,128,157,2,212,
   157,96,206,12,0,0,12,0,0,
   138,24,1249
2200 DATA 105,7,170,224,15,
   144,148,96,189,112,206,
   157,1,212,189,113,2088
2210 DATA 206,157,0,212,96,
   162,0,189,90,206,133,170,
   189,87,206,133,2236
2220 DATA 171,189,93,206,133,
   172,189,81,206,133,173,
   189,84,206,133,174,2532
2230 DATA 189,96,206,133,177,
   189,78,206,133,176,189,75,
   206,133,175,142,2503
2240 DATA 37,207,189,44,206,
   170,169,0,32,196,204,174,
   37,207,165,170,2207
2250 DATA 157,90,206,165,171,
   157,87,206,165,172,157,93,
   206,232,224,3,2491
2260 DATA 208,181,173,90,206,
   205,2,100,240,1,96,173,87,
   206,205,3,2176
2270 DATA 100,240,1,96,169,4,
   141,90,206,169,100,141,87,
   206,173,0,1923
2280 DATA 100,141,91,206,173,
   1,100,141,88,206,173,2,
   100,141,92,206,1961
2290 DATA 173,3,100,141,89,
   206,169,8,141,93,206,141,
   94,206,141,95,2006
2300 DATA 206,76,78,203,32,
   50,206,198,172,165,172,
   208,63,160,0,157,2146
2310 DATA 4,212,165,174,157,
   5,212,165,175,157,3,212,
   165,176,157,6,2145
2320 DATA 212,177,170,157,1,
   212,32,8,207,200,177,170,
   157,0,212,157,2249
2330 DATA 113,206,200,177,
   170,133,172,165,177,157,2,
   212,165,173,157,4,2383
2340 DATA 212,165,170,24,105,
   3,133,170,144,2,230,171,
   96,189,117,206,2137
2350 DATA 160,65,201,1,240,
   14,160,33,201,2,240,8,160,
   17,201,3,1706
2360 DATA 240,2,160,129,152,
   157,4,212,96,1,157,35,207,
   76,58,205,1891
```

```
2440 DATA 172,165,172,24,105,3,133,172,165,173,32,218,194,26,172,0,1926
2450 DATA 4,136,177,170,201,44,240,11,201,0,240,4,200,76,146,194,2044
2460 DATA 76,77,192,200,76,83,192,238,104,4,173,104,4,208,3,238,1972
2470 DATA 105,4,96,67,137,43,67,145,83,68,153,247,68,163,31,69,1546
2480 DATA 172,210,70,183,25,70,193,252,71,205,133,71,217,189,65,230,2356
2490 DATA 176,65,244,103,66,129,120,82,0,0,105,0,133,173,76,167,1639
2500 DATA 194,82,162,0,142,32,208,142,33,208,169,1,157,0,216,189,1935
2510 DATA 251,194,157,0,4,232,208,242,76,74,196,93,225,178,221,179,2530
2520 DATA 97,93,225,181,221,182,221,183,97,93,225,185,221,176,97,93,2590
2530 DATA 225,173,221,156,221,147,97,93,225,134,221,135,97,93,225,138,2601
2540 DATA 97,32,32,93,225,160,221,160,97,93,225,160,221,160,221,160,2357
2550 DATA 97,93,225,160,221,160,97,93,225,160,221,160,221,160,97,93,2483
2560 DATA 225,160,221,160,97,93,225,160,97,32,32,93,32,93,32,93,1845
2570 DATA 32,93,32,93,32,93,32,93,32,93,32,93,32,93,32,93,1000
2580 DATA 32,93,32,93,32,93,32,93,32,93,32,93,32,93,32,93,1000
2590 DATA 32,32,32,93,17,93,23,93,5,93,18,93,20,93,25,93,855
2600 DATA 21,93,9,93,15,93,16,93,0,93,42,93,26,93,24,93,897
2610 DATA 3,93,22,93,2,93,14,93,32,32,32,113,64,113,64,113,976
2620 DATA 64,113,64,113,64,113,64,113,64,113,64,113,64,113,64,113,1416
2630 DATA 64,113,64,113,64,113,64,113,64,113,64,113,64,113,64,113,1416
2640 DATA 64,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,544
2650 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
2660 DATA 32,32,32,32,32,32,32,32,32,32,32,14,15,20,5,32,438
2670 DATA 58,45,32,32,32,32,32,32,32,32,32,81,87,69,82,84,794
2680 DATA 89,85,73,79,80,64,42,90,88,67,86,66,78,50,51,53,1141
2690 DATA 54,55,57,48,45,92,83,70,71,74,160,67,68,69,70,71,1154
2700 DATA 65,66,208,67,68,70,71,65,95,137,43,153,247,172,210,183,1920
2710 DATA 25,205,133,230,176,129,120,142,24,159,126,189,172,212,230,238,2510
2720 DATA 248,0,2,240,21,205,63,198,240,5,32,228,255,240,251,201,2429
2730 DATA 136,208,1,0,162,0,221,251,195,240,8,232,224,32,144,246,2300
2740 DATA 76,74,196,169,1,141,65,3,142,66,3,224,18,144,3,76,1401
2750 DATA 230,196,224,7,144,11,138,56,233,7,170,238,65,3,76,114,1912
2760 DATA 196,169,32,32,25,197,138,10,168,185,41,196,141,67,3,185,1785
2770 DATA 42,196,141,68,3,173,65,3,24,105,50,32,36,197,173,65,1373
2780 DATA 3,201,6,240,12,238,65,3,78,67,3,110,68,3,76,158,1331
2790 DATA 196,76,192,196,141,250,4,189,27,196,11,63,141,251,4,96,2033
2800 DATA 169,0,141,4,212,169,25,141,5,212,173,67,3,141,1,212,1675
2810 DATA 173,68,3,141,0,212,169,33,141,4,212,169,15,141,24,212,1717
2820 DATA 141,6,212,76,74,196,169,35,141,250,4,138,56,233,18,170,1919
2830 DATA 224,5,144,11,238,65,3,138,56,233,5,170,76,240,196,138,1942
2840 DATA 10,168,185,55,196,141,67,3,185,56,196,141,68,3,189,35,1698
2850 DATA 196,11,63,141,251,4,76,149,196,32,180,196,224,6,208,3,1936
2860 DATA 238,65,3,96,141,249,4,224,6,208,3,206,249,4,96,0,1792
2870 DATA 6,38,237,22,35,97,6,40,57,22,45,25,166,20,103,6,925
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2370 DATA 32,62,207,157,36,207,201,5,144,232,138,24,105,7,170,26,1753
2380 DATA 224,15,144,203,96,160,0,189,90,206,133,170,189,87,206,133,2245
2390 DATA 171,177,170,141,47,206,200,177,170,141,48,206,173,47,206,205,2485
2400 DATA 48,206,208,224,76,23,207,208,8,177,170,141,24,212,76,24,2032
2410 DATA 206,201,2,208,8,177,170,157,84,206,76,24,206,201,3,208,2137
2420 DATA 8,177,170,157,81,206,76,24,206,201,9,208,8,177,170,157,2035
2430 DATA 96,206,76,24,206,201,10,208,8,177,170,157,78,206,76,24,1923
2440 DATA 206,201,14,208,8,177,170,141,73,206,76,24,206,201,11,208,2130
2450 DATA 8,177,170,141,23,212,76,24,206,201,12,208,8,177,170,141,1954
2460 DATA 22,212,76,24,206,201,13,208,8,177,170,141,21,212,76,24,1791
2470 DATA 206,201,4,208,5,177,170,76,17,207,141,99,206,142,100,206,2165
2480 DATA 189,44,206,170,173,99,206,201,5,208,8,177,170,157,115,206,2334
2490 DATA 76,20,206,201,6,208,8,177,170,157,116,206,76,20,206,201,2054
2500 DATA 7,208,8,177,170,157,117,206,76,20,206,201,8,208,5,177,1951
2510 DATA 170,157,118,206,174,100,206,26,189,90,206,24,105,3,157,90,2021
2520 DATA 206,189,87,206,105,0,157,87,206,76,69,205,0,7,14,61,1675
2530 DATA 25,82,165,172,201,11,208,8,165,173,56,233,1,157,4,212,1873
2540 DATA 96,189,112,206,24,125,113,206,96,1,0,6,6,6,39,39,1264
2550 DATA 39,65,17,17,28,28,28,100,127,116,127,115,225,6,4,2,1044
2560 DATA 128,128,128,7,2,2,165,62,213,131,181,62,45,127,60,3,1444
2570 DATA 61,25,0,0,0,3,1,45,220,0,0,0,0,1,45,242,643
2580 DATA 0,0,0,3,1,0,0,0,0,0,0,0,0,7,167,178
2590 DATA 0,0,0,0,0,4,160,0,0,0,0,0,157,75,206,76,678
2600 DATA 24,206,201,0,240,6,200,201,1,76,103,205,96,6,169,96,1830
2610 DATA 133,124,165,122,2,165,123,72,138,201,34,8,30,71,1,6,1395
2620 DATA 229,5,104,133,78,25,9,122,9,121,0,162,1,8,12,8,1026
2630 DATA 1,6,2,228,8,6,92,70,9,240,9,104,2,162,12,8,959
2640 DATA 1,0,12,8,201,34,1,82,201,6,9,49,201,58,208,2,1073
2650 DATA 8,8,201,125,1,6,12,7,204,141,121,25,9,200,16,137,1221
2660 DATA 255,0,255,0,255,0,255,0,157,112,206,4,0,157,34,207,1897
2670 DATA 96,157,75,206,76,24,206,201,0,240,6,200,201,1,76,103,1868
2680 DATA 205,96,61,1,0,2,255,0,255,45,1,1,255,0,255,0,1432
2690 DATA 45,1,3,0,255,0,255,189,36,207,24,105,5,96,189,36,1446
2700 DATA 207,56,233,5,96,189,112,206,74,74,141,116,207,189,113,206,2224
2710 DATA 24,109,116,207,157,113,206,189,112,206,105,0,157,112,206,96,2115
2720 DATA 189,112,206,10,24,125,113,206,157,0,212,189,112,206,105,0,1966
2730 DATA 157,1,212,96,11,1,0,251,255,240,8,232,224,32,255,246,2221
```

PROGRAM: EXAMPLE 1

```
1000 REM EXAMPLE 1 - SIMPLE
   SCALE
3000 DATA-T002,-J000,-K010,
   -H193,-4031
3001 DATA-6065,-5126,-9046,
   -7002,-8128,-Z1
3002 DATA 4C4,4D4,4E4,4F4,
   4G4,4A4,4B4,5C4
4999 DATA-1
5000 DATA-6000,-5000,-9000,
   -7000
5001 DATA 0R50,0R50
6999 DATA-2
7000 DATA-6000,-5000,-9000,
   -7000
7001 DATA 0R50,0R50
8999 DATA-3
```

PROGRAM: EXAMPLE 2

```
1000 REM EXAMPLE 2 - WOBBLER
3000 DATA-T002,-J000,-K000,
   -H000,-4015
3001 DATA-6065,-5074,-9044,
   -7008,-Y2
3002 DATA 6E4,6F4,6G8,6E8,
   6C8,6#D12,6D12,6C48,5G8,
   5#A4,5A4,5G8,0R1
4999 DATA-1
5000 DATA-6033,-5044,-9044,
   -7000,-W1
5001 DATA 3C8,4C8,2G8,3G8,
   2#A8,3#A8,2F8,3F8
5002 DATA 3C8,4C8,2G8,3G8,
   2#G8,3#G8,2#A8,3#A8
6999 DATA-2
7000 DATA-6033,-5044,-9044,
   -7008,-W1
7001 DATA 3C8,4E8,2G8,3B8,
   2#A8,4D8,2F8,3A8
7002 DATA 3C8,4E8,2G8,3B8,
   2#G8,4C8,2#A8,4D8
8999 DATA-3
```

PROGRAM: EXAMPLE 3

```
1000 REM EXAMPLE 3 - DRUMS
3000 DATA-T001,-J000,-K000,
   -H000,-4015
3001 DATA-6129,-5004,-9008,
   -7000
3002 DATA 7C4,7C4,7C4,7C4,
   -5006,7C4,-5003,7C4,7C4,
   7C4
3003 DATA 7C4,7C4,7C4,7C4,
   -5006,7C4,-5003,7C4,7C4,
   7C4
3004 DATA 7C4,7C4,7C4,7C4,
   -5006,7C4,-5003,7C4,7C4,
   7C4
3005 DATA 7C4,7C4,7C4,7C4,
   -5006,7C4,-5003,7C4,-5006,
   7C4,-5003,7C4
4999 DATA-1
5000 DATA-6129,-5005,-9028,
   -7000,-W1
5001 DATA 0R16,4C16,0R16,
   4C16,0R16,4C16,0R8,4C8,
   0R8,4C8
6999 DATA-2
7000 DATA-6129,-5005,-9006,
   -7000,-Z1
7001 DATA 3C16,0R8,3C8,3C16,
   0R8,3C8,3C16,0R8,3C8,3C16,
   3C16
8999 DATA-3
```

PROGRAM: EXAMPLE 4

```
1000 REM EXAMPLE 4 - RENAISS
   ANCE
3000 DATA-T003,-J000,-K090,
   -H193,-4031,-W1
3001 DATA-6065,-5044,-9044,
   -7008
3002 DATA 4C12,4#D12,4G12,
   5C6,5D3,5#D3,5F3,5#D3,5D3,
   5C3,4B12,0R1
4999 DATA-1
5000 DATA-6017,-5044,-9044,
   -7000
5001 DATA 3C12,3C12,2#A12,
   2#G24,2G12,0R1
6999 DATA-2
7000 DATA-6017,-5044,-9044,
   -7000
7001 DATA 4C12,4C12,4D12,
   4#D24,4D12,0R1
8999 DATA-3
```

Try It Out

A number of example programs are printed with this article. Try them out for yourselves and make sure you understand how they work before trying to enter your own music.

If you use this program to write any interesting music then why not send it along to the magazine and it may even be printed for other people to enjoy (we pay for anything we print – Ed).

Typing Traumas

If you don't want to type this program in, Wizard Devlopment has come to your rescue. A cassette version of this program is available from Wizard for £5.00. This cassette not only contains all the programs published here but there are also a large number of example music programs included for your enjoyment, many of them far too long to be printed in a magazine. So why not save yourself some trouble and get some extra programs as well. Simply complete the order form and send with a cheque for £5.00 made payable to Wizard Developments Ltd and post it to the address on the form.

Music Master is **not** on this month's Your Commodore Software Cassette.

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Word Processor
A fully-featured word processor program with text formatting - right justification - adjustable page length - text centering - output of all or part of text to printer - selective saving - file concatenation - block move - block delete - reverse print - graphics print - double width print - sorting - left and right margin selectable - word count - search and replace.

Mailing List
This program will enable you to keep a record of names and addresses and then print, examine, sort and find them, all with special selection techniques. Featuring the famous Gemini 'search-key' system, you have the option of creating your own dedicated coding routines for each name on the file.
For example, on most mail systems you are only given the standard headings such as name, street, town, county, etc. but with our system, you could for example find all companies listed that have a turnover in excess of a certain figure, or all subscribers who are behind with their subscriptions, or all people eligible for a Christmas card this year! A full range of utilities is callable from the menu including, ofcourse, label printing.

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Superior file management system with features found only with packages costing much, much more. Completely user-definable data entry format - colours definable - advanced mathematics using built-in machine code expression evaluator - fast sort on numeric and string fields - extensive searching with 'wild card' capability - user-definable data summaries - simple on-screen editing. A really POWERFUL database!

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Designed as a complete home accounting package, this program allows the user to set up and maintain a budget for items of household expenditure and compare actual with budget ,either numerically, or with the aid of chart graphics. A complete bank account routine is included, together with standard expenditure categories which may be changed to suit.

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Gemini's legendary cash book system for the CBM is a complete 'stand-alone' accounting software package, already in extensive use by both accountants and their clients.

General System Overview
The Gemini cash book package for the Commodore 64/128 microcomputer is designed for a hardware system consisting of:
1. Commodore 64/128 microcomputer.
2. 80 column printer.
3. Cassette or disk data storage.

Please note that running the program on disk will not change the way that the program works, but you will have the benefit of far greater speed and reliability for the loading and saving of files that a disk system provides.
There is a total of 199 nominal accounts, a large number of which may be defined by the user. You may have up to four cash control accounts, six bank control accounts, one sales ledger and one purchase ledger control account.
The program will store a data file consisting of:
1. The account titles.
2. The current cumulative balance on each account (debit or credit).
3. The net movement on each account for every month of the year.
4. VAT net sales and net payments figures, which are automatically created and maintained by the program.

This same data file is used by the FINAL ACCOUNTS program. The 'VAT FILE' which accompanies this package is designed primarily for those users on the Retailers special VAT schemes.
The main features of the CASH BOOK program are as follows:
1. Double entry routines for transactions through the cash/bank accounts and sales/purchase ledger control accounts.
2. Journal facility for the initial set up of accounts, or for adjustments to any of the accounts.
3. The facility to produce the following screened or printed reports:
(a) Listing of all the nominal account titles.
(b) Monthly transaction summaries.
(c) A trial balance whenever required.
(d) Screen VAT memo account balances (sales/net purchases, and VAT accounts).
(e) A batch printing facility which provides details of all the transactions entered in the current run of the program.
4. The facility to extract regular management information such as cash/bank balances, debtors and creditors, sales, overheads, etc.
5. The program interfaces with the Gemini FINAL - ACCOUNTS program to enable Trading and Profit and Loss accounts and Balance Sheet to be produced whenever required. Comparative or budget figures can be shown alongside the actual figures using this program.
6. Screen prompts throughout the program to facilitate ease of use.
7. Storage of VAT information to assist in the preparation of periodic VAT returns.
8. Error trapping routines to minimise input errors.
9. The facility to handle the financial transactions of sole traders, partnerships, limited companies, clubs, etc.

Users registered for VAT are reminded that it is a statutory requirement to inform their local VAT office when they change their accounting records on to a new computerised accounting system.

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Programming

Joe Nicholson continues his popular series on the C-16.

THERE ARE TWO OTHER GRAPHICS modes available on the Commodore-16 in addition to those described in the User manual. These are Multi-Colour Character mode and Extended Background Colour mode.

Multi-Colour Character Mode

As well as being available in high resolution, Multi-colour mode can also be made to work in low-res. Bit four of address 65287 ($FF07) contains the 'Multi-Colour mode select bit'. It is important to make sure, however, that the other Bits at this address remain unaltered. To turn Multi-Colour mode on in-low resolution:

```
POKE 65287,PEEK (65287) OR 16
```

To turn Multi-Colour mode off in low resolution:

```
POKE 65287,PEEK (65287) and 239
```

Why use Multi-Colour Character Mode? When standard character mode is used, each character has a choice of only one background colour and one foreground colour, but Multi-Colour mode allows each pixel (dot) to be any of four colours: either background colour, foreground/character colour, multi-colour #1 or multi-colour #2. Each 'dot' in Multi-Colour mode is twice as wide as Standard colour mode, giving half the horizontal resolution. Multi-Colour mode can be set on or off for each character on the screen, so that the Standard and Multi-Colour modes can be mixed on the screen at the same time.

Bit three of each byte in the TED Atrribute area ($0800-$0BFF hex, 2048-3071 decimal) controls whether each character is in Multi-Colour mode or not. Bit three is set for Multi-Colour mode. This has the limitations of only allowing colours zero to seven to be used as the character colour, as Bit three used to be the highest bit of the character colour. Therefore in low resolution mode, if the colour is less than eight (zero for Black through to seven for Yellow) then the character is displayed in Standard mode; if the colour number is eight to 15 then the character is displayed in Multi-Colour mode with the background colour being the colour number minus 8. The following table should make things clearer:

Foreground Colour	Result
0 - 7	Standard mode. Colours: 0 (Black) to 7 (Yellow)
8 - 15	Multi-Colour mode. Colours: 8 (Black) to 15 (Yellow)

Therefore, to turn the whole screen into Multi-Colour mode (after Multi-Colour character mode has been turned on) type:

```
COLOR 1,8:SCNCLR
```

When Multi-Colour mode has been selected in each character, each character horizontal line is divided into four pairs of bits:

Bit Pair	
00	Displays the Background color
01	Displays Multi-Colour #1
10	Displays Multi-Colour #2
11	Displays the foreground character colour 0-7, which may be different, of course, for each character position position on the screen.

Figure 1 shows the Multi-Colour image of an '@' sign:

Binary	Image
00111100	. . CC CC . .
01100110	AA . . AA BB
01101110	AA . . CC BB
01101110	AA . . CC BB
01100000	AA . . . . .
01100010	AA . . . . BB
00111100	. . CC CC . .
00000000	. . . .
Where: . .	is background colour,
AA	is Multi-Colour # 1,
BB	is Multi-Colour # 2,
CC	is foreground colour for that character.

Multi-Colour mode has the disadvantage of disabling the hardware Flash facility, which means that the cursor is not usually visible. Hence, this mode should only be used from within a program.

Multi-Colour #2, background and foreground colour are controlled with the COLOR command.

Multi-Colour #1 is not, surprisingly, accessed from the COLOR command in Multi-Color character mode (COLOR 2,xx has no effect); the colour and luminance values must be POKEd into address 65303 ($FF17). At this address:

Bits 0-3 contain the colour (0-Black – 15 Green)
Bits 4-6 contain the luminance (0-7)
The number to be POKEd into address 65303 is therefore:
Colour + (luminance * 16)

The program in Figure 2 demonstrates how Multi-Colour character mode works. Please note that the triangle with a line below it represents a Cursor Left symbol.

RUN the program. As both Multi-Colour #1 and Multi-Colour #2 are both set to black, you should at first only see the specks of the foreground colour showing on the Multi-Colour characters. By pressing RETURN you can make the new Multi-Colour colour immediately change the colour of the these characters.

Programmable Multi-Colour Characters

Of course, Multi-Colour characters are of no use unless the characters are reprogrammed. As an exercise, try to create some multicolour programmable characters by refering to the article in this series on programmable characters. Hint: As most of the ROM characters are virtually unreadable in Multi-Colour character mode, there is no need to move a ROM character set down into the 1K block. Instead, make sure that you blank out the 'SPACE' character with zeros to stop the screen filling with rubbish. Figure 3 shows my attempt.

There now follows as explanation of the Multi-colour Programmable Character Demo in Figure 3.

100 Lowers memory 1K (see the C-16 article on 'Where to store machine code').
150 POKEs in graphics for flag.
160 POKEs zeros into the space

The C-16



character. This is needed because the ROM character set has not been shifted down into RAM.
200 Stops the Shift+Commodore Key changing character sets. Sets the 'Base address of the character set' pointer to point to 1K below the top of the 16K RAM. Selects character set data to come from RAM.
210 Turns on Multi-Colour mode.
220 Sets TRAP to go to line 250, then jumps to line 300.
250 TRAP routine. Prints error and line number of error.
260 Turns off programmable characters mode.
270 Turns off Multi-Colour mode, changes foreground to a readable colour, and ENDs.
300 Sets background colour, border colour, and clear screen.
310 Sets foreground colour to blue. Sets Multi-Colour # 2 to red. Sets Multi-Colour # 1 to white.
350-370 Print flag.
500 Plays tune.
510 Pause.
520 Jump to turn off programmable and Multi-Colour graphics modes.
1000-1110 DATA for flag.
2000-2070 DATA for music.

Extended Background Colour Mode

Extended background colour mode gives you control of the background colour for EACH character on the screen as well as the foreground colour. Extended background colour allows, for instance, bright red text on a dark blue background on a white screen. In this mode only the first 64 characters (0-63) of the character set can be used. The reason is that the top two bits of each character code (bits six and seven), used to select the background colour. In 'upper case and graphics' mode the first 64 characters contain all characters apart from graphics. In 'lower/upper case mode', although the first 64 characters appear to contain only lower case, numbers and punctuation, characters written in both lower case and upper case will be displayed in upper case.

Allocation of Bits to a character code in extended background character mode:

```
           :
11:  111111
           :
Background : Character code
colour     : (0-63)
select     :
```

The top two bits select the background colour as follows:
00 Normal screen background colour.
01 Multi-Colour # 2 – set by the COLOR 3,xx command.
10 Multi-Colour # 1 – can only be changed by POKEing address 65303 ($FF17) with the colour (0 for Black to 15 for light Green, not 1 to 16 as for the COLOR com + the luminance (0-7) * 16. e.g. POKE 65303,3+(5*16). This POKEs Multi-Colour # 1 with light red (Red 2, of luminance 5).
11 The Extended Colour register at 65304 ($FF18). POKE to this in the same way as to address 65303, as explained above.
Hence:
a) All characters with codes 0-63 display characters 0-63 in normal background colour.
b) Characters with codes 64-127 display characters 0-63 with Multi-Colour # 2 as the background colour.
c) Characters with codes 128-191 display characters 0-63 with Multi-Colour # 1 (65303) as the background colour.
d) Characters with codes 192-255 display characters 0-63 with Extended Colour (65304) as the background colour.

Bit six of address 65286 ($FF06) contains the flag that turns on or off Extended background colour mode. This bit is zero for on. When changing this bit, it is important that the other bits at that address remain unaltered.

To turn on Extended background colour mode, type:

POKE 65286,PEEK (65286) OR 64

To turn off Extended background colour mode, type:

POKE 65286,PEEK (65286) and 191

As with Multi-Colour mode, a disadvantage with this mode is that the hardware Flash is disabled, meaning that the cursor will not be visible. Therefore, all editing should be done in normal mode.

Figure 4 is a demonstration program of Extended Background Colour Mode. Enter it in lower case mode exactly as shown. Please note, the underlined lower case 'r' represents RVS ON.

Programming The C-16

Figure 1

```
10 REM MULTICOLOUR CHARACTER DEMO
100 POKE65287,PEEK(65287)OR16
110 COLOR0,1:COLOR4,1:COLOR1,4,5:SCNCLR
120 PRINT"MULTICOLOR MODE. COLORS 1-8 (0-7 IN MEM)ARE D
ISPLAYED IN STANDARD MODE
.."
130 FORA=1TO8
140 COLOR1,5,6:PRINTATAB(6);:COLOR1,A,5:PRINT"@ABCDEFGH
IJKLMNOPQ1234567890":NEXT
150 COLOR1,4,5:PRINT:PRINT"BUT COLORS 9-16 (8-15 IN MEM
) ARE"
160 PRINT"DISPLAYED IN MULTICOLOR MODE.."
170 FORA=9TO16
180 COLOR1,5,6:PRINTATAB(6);:COLOR1,A,5:PRINT"@ABCDEFGH
IJKLMNOPQ1234567890":NEXT
190 COLOR1,4,5:PRINT:PRINT"I WILL NOW CHANGE MULTI-#1 A
ND MULTI-#2"
200 FORA=0TO15:FORB=1TO16
210 CHAR,0,23,"PRESS A KEY":PRINTTAB(23)A+1,B"[LEFT]"
220 POKE65303,A+(6*16):COLOR3,B,5
230 GETKEYA$:NEXT:NEXT
300 POKE65287,PEEK(65287)AND239
```

Figure 2

```
10 REM EXTENDED BACKGROUND COLOUR DEMO
100 POKE65286,PEEK(65286)OR64
110 COLOR0,2,7:COLOR4,5,5:COLOR1,1:SCNCLR
200 COLOR3,3,5:POKE65303,3+(6*16):POKE65304,6+(7*16)
210 PRINT"CHARACTERS 0-63 ARE DISPLAYED IN NORMAL BACKG
ROUND COLOUR..."
220 PRINT"ABCDEFGHIJKLMN"
230 GETKEYA$
250 PRINT:PRINT"CHARACTERS 64-127 ARE DISPLAYED IN","MU
LTICOLOUR#2."
260 PRINT"THIS HAS BEEN SET TO RED USING THE ","COLOR3,
3,5 COMMAND..."
270 PRINT"[SA,SB,SC,SD,SE,SF,SG,SH,SI,SJ,SK,SL,SM,SN]"
280 GETKEYA$
300 PRINT:PRINT"CHARACTERS 128-191 ARE DISPLAYED IN","M
ULTICOLOUR#1"
310 PRINT"THIS HAS BEEN SET TO CYAN BY USING THE","POKE
65303,3+(6*16) COMMAND...
"
320 PRINT"[RVSON]ABCDEFGHIJKLMN"
330 GETKEYA$
400 PRINT:PRINT"CHARACTERS 192-255 ARE DISPLAYED IN","E
XTENDED COLOUR"
410 PRINT"THIS HAS BEEN SET TO LIGHT BLUE BY","USING TH
E POKE65304,6+(7*16) COMM
AND"
420 PRINT"[RVSON,SA,SB,SC,SD,SE,SF,SG,SH,SI,SJ,SK,SL,SM
,SN]"
430 GETKEYA$
500 POKE65286,PEEK(65286)AND191
```

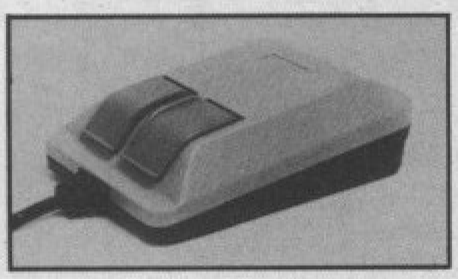
Figure 3

```
10 REM   MULTICOLOUR PROGRAMMABLE
20 REM        CHARACTER DEMO.
100 POKE56,59:POKE52,59:CLR
150 FORA=0TO95:READB:POKE15360+A,B:NEXT
160 FORA=0TO7:POKE15360+(32*8)+A,0:NEXT
200 PRINTCHR$(8):POKE65299,60:POKE65298,PEEK(65298)AND2
51
210 POKE65287,PEEK(65287)OR16
220 TRAP250:GOTO300
250 PRINTERR$(ER),EL
260 POKE65299,208:POKE65298,PEEK(65298)OR4
270 POKE65287,PEEK(65287)AND239:COLOR1,2,7:END
300 COLOR0,1:COLOR4,1:SCNCLR
310 COLOR1,15,3:COLOR3,3,5:POKE65303,1+(7*16)
350 CHAR,0,10,"@CFI   @CFI   @CFI   @CFI   @CFI   @CFI
"
360 PRINT"ADGJ   ADGJ   ADGJ   ADGJ   ADGJ   ADGJ"
370 PRINT"BEHK   BEHK   BEHK   BEHK   BEHK   BEHK"
500 VOL7:FORA=1TO45:READB,C:SOUND1,C,B*20:SOUND2,C+2,B*
20:NEXT
510 FORA=1TO3000:NEXT
520 GOTO260
998 REM
999 REM GRAPHICS...
1000 DATA0,0,175,171,170,234,250,254
1010 DATA255,255,85,85,85,255,255,254
1020 DATA250,234,170,171,175,0,0,0
1030 DATA0,0,253,253,253,189,173,169
1040 DATA169,233,85,85,85,233,169,169
1050 DATA173,189,253,253,253,0,0,0
1060 DATA0,0,127,127,127,126,122,106
1070 DATA106,107,85,85,85,107,106,106
1080 DATA122,126,127,127,127,0,0,0
1090 DATA0,0,250,234,170,171,175,191
1100 DATA255,255,85,85,85,255,255,191
1110 DATA175,171,170,234,250,0,0,0
1998 REM
1999 REM MUSIC...
2000 DATA1,596,1,596,1,643,1.5,571,.5,596,1,643
2010 DATA1,685,1,685,1,704,1.5,685,.5,643,1,596
2020 DATA1,643,1,596,1,571,1,596,.5,596,.5,643
2030 DATA.5,685,.5,704,1,739,1,739,1,739,1.5,739
2040 DATA.5,704,1,685,1,704,1,704,1,704,1.5,704
2050 DATA.5,685,1,643,1,685,.5,704,.5,685,.5,643
2060 DATA.5,596,1.5,685,.5,704,1,739,.5,770
2070 DATA.5,704,1,685,1,643,3,596
```

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WELCOME TO THE MACHINE

This month we start a new series by Allen Webb which will introduce you gently to the hazards of machine code.

IN THIS SERIES, I PLAN TO INTRODUCE the basics of machine code on the 6510/6502 microprocessors. Before you throw this magazine into the fire in disgust, I intend to make this series as lightweight as possible with the inclusion of examples which will be both instructive and useful. I don't intend to make you an expert in machine code – that's up to you. But you should be able to write reasonably complex programs by the time I've finished.

First, why learn machine code? Here are a few reasons.

1. It is a fast and compact language which uses the processor most efficiently.
2. It offers an intellectual stimulus by requiring a disciplined and logical approach to programming.
3. It's more fun that Basic!

Before diving into the subject, I want to consider what tools you will need to help you in your endeavours. First, you will need the necessary development software, primarily an assembler and a machine code monitor. The choice of this software is vitally important since it can mean the difference between a long, happy relationship with machine code and insanity.

When you look for an assembler, you should look for the following features as a minimum:

1) A sensible editor for writing the source code.
2) An assembler which supports both labels and variables.
3) If possible – Macros (more of this later).
4) If you plan to write large programs – disk based.
5) Ensure that the assembler will generate a full source code listing on assembly with symbol tables with full printer options.

A decent assembler is not cheap so insist on the best you can afford, it's probably the best investment you'll make.

Similarly, the monitor should have the following features:

1) Full commands for the manipulation of blocks of code – including search with replace, relocate.
2) In-built assembler and dis-assembler for "fine tuning" of code.
3) Debugging and tracing tools such as single step, break points etc.
4) Full Save/Load facilities with relocating load.

To help you with your search, here are some packages of note:

---

1. *Mikro Assembler* (Supersoft Cartridge £57.50). This is a well loved old faithful which has been around for quite some time, not as sophisticated as some but totally reliable.

Pros
1) Reliable
2) Contains simple monitor on board
3) Two pass, full label facility
4) Allows linked disk files
5) Supports both serial and parallel printers

Cons
1) No debugging commands
2) 12K limit on single block of code. To assemble larger programs, need to use a few tricks.
3) Perhaps a little pricey

I am advised by Peter Calver of Supersoft that a version for the 128 is in the pipeline and that it will operate in 128 mode rather than simply being the 64 version (sounds good).

---

2. *Assembler Monitor 64* (First Publishing Ltd, £19.99 disk). This is a combined package which includes a monitor of fair capabilities.

Pros
1) Sophisticated commands for macros, conditional assembly etc.
2) Powerful disk options with linked files and assembly from and to disk
3) Full printer options
4) Two pass with full labels
5) Reasonable price.

Cons
1) Disk only
2) No disassembler
3) Need to load a separate program for alphabetic symbol tables

---

3. Machine Lightning (Oasis Software, disk or cassette). Released as a games writing package, the assembler is highly sophisticated and works as a stand alone.

Pros
1) Available on disk and cassette. Cassette version works equally well on disk files.
2) Custom written operating system, bristles with features including DOS.
3) Macros, full labels.

Cons
1) Expensive
2) Instructions comprehensive but confused and poorly written
3) Behaves oddly if you wish to use routines in the Basic ROM. I believe this is an artefact due to the fact that the graphics command sits behind this ROM.
4) Non standard monitor

---

4. *Zoom Monitor* (Supersoft, Disk: £14.95, Cassette: £12.95, Cartridge: £18.75) In my opinion, this is the best British monitor I've seen (the American monitor from HES is also pretty good). Fully relocatable so that you can avoid your object code. In light of the weak monitor in the Mikro Assembler, this is its ideal working partner.

Pros
1) Almost all commands you will need
2) Available in all formats
3) Loads relocatable. Tape based object codes can be forced to relocate absolutely.
4) Additional DOS commands and hex/decimal conversions.
5) Format quite standard.
6) Assembler, disassembler and debugging commands.

Cons
1) I can't find any except that bidirectional scrolling isn't supported.

If you have insufficient funds but sufficient stamina, you can use two packages given in Your Commodore:

1. Steve Carrie's package in the November, December (1985) and January (1986) issues. This provides an editor, assembler and monitor and looks pretty good. Not only that, it only costs the price of three issues.
2. Hypabasic gives a beeb style assembler which is ideal to help you learn but perhaps insufficient for a 40K mega-game.

OK, you've got the software, what other support do you need? Well, here it is (in descending order of value):

1. A copy of one of the standard works on the 6510/6502. I use Zaks although there are others (Programming the 6502 by Rodney Zaks – Sybex – ISBN 0-89588-046-6).
2. A decent memory map of the 64 – the Programmer's Reference Guide is as good as any.
3. Membership to the Independent Commodore Products User Group – I read their quarterly newsletter (well, it's more of a book actually) with great relish. (Membership Secretary – Jack Cohen, 30 Branchester Rd, Newbury Park, Ilford, Essex) Even if you don't want to write machine code, join. It's great value for money with hints, reviews, useful information and discounts on soft and hardware.
4. A learn to write machine code book. But please buy with care, there's an awful lot of garbage around and I have yet to find one that really teaches machine code to a decent level.

Having said that, the *Beginner's Assembly Language Course* by Derek Bush and Peter Holmes is pretty good in that it combines a simple assembler with a decent book. Plenty of exercises are given and the standard isn't bad.

OK, let's start work. Figure 1 gives a simplified version of the 6502/6510's architecture. It's really fairly simple. The micro-processor comprises a number of registers which converse with one another by use of the data and address buses. You may find it easier to think of the registers as boxes of two sizes, eight bits and 16 bits wide. First we have the Accumulator (A on the diagram). This register is involved in most of the data transfers and arithmetic activities. The accumulator is eight bits wide so it can only contain numbers between zero and 255 (I'll explain why shortly). Along with the accumulator, we have three other eight bit registers. The X and Y registers are similar to the accumulator but of lesser capabilities. They are mostly used as counters and temporary storage. The bits in the status register (S) are used to tell you what's happening in the processor. If, for example, a calculation results in a minus value, bit seven (the negative flag) will be set. Only seven of the status register's bits are used and these are called flags.

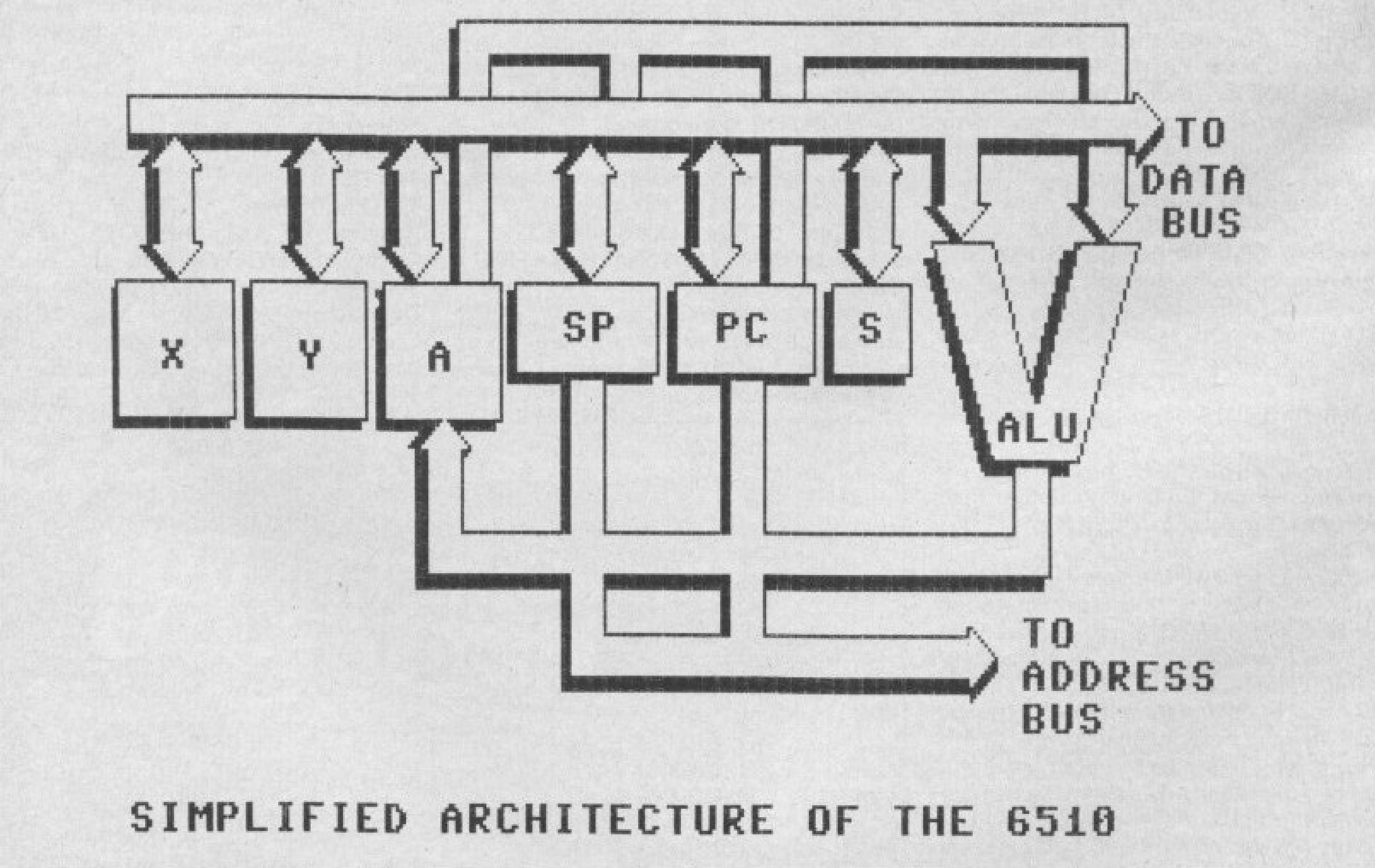
The microprocessor uses an area of memory (the stack) as a scratch pad to enable it to remember where it's got to. The current position of the stack is kept in the stack pointer (SP). Similarly, the microprocessor needs to know where it's got to in a program. The address of the current command is held in the program counter (PC). This is a 16 bit register holding any value between zero and 65535. That's why the 6502/6510 can only directly address a maximum of 64K. But more of that later.

Two types of basic data are required by the system. First, a value of data. This trots along the data bus. The machine also needs to know where to stick it (no dirty comments please). Hence the address bus. The last bit of the micro is the Arithmetic Logical Unit. This performs, in conjunction with the accumulator, arithmetic and logic functions (surprised huh?). You'll appreciate the functions of the ALU once we move on to arithmetic and logic functions.

Before I finish, it's time for a little toil so activate your brain cells. I want to discuss a little about binary, bits and other sundry rubbish.

First, what does 1,732 mean?

Yes, I know it stands for one thousand seven hundred and thirty two but what does it represent? Well we're dealing with



SIMPLIFIED ARCHITECTURE OF THE 6510

counting to the base 10 (you know, the number of fingers on two hands).

If you accept that 1000 is 10 cubed, 100 is 10 squared, 10 is 10 to the power one and one is 10 to the power zero, we can rewrite 1,732 in another way:

$$1732 = 1\times10^3+7\times10^2+3\times10^1+10^0$$

You may notice that the highest power of the base is the number of digits less one.

If we call the base to which we are counting N, then the generalised form of any number of n digits to that base will be:

$$D_{n-1}\times^{n-1}+\ldots\ldots D_2\times N^2+D_1\times N^1+D_0\times N^0$$

The n-1 term appears since by convention we call the lowest digit or bit the zero digit or bit.

In binary, N=2, i.e. we have only two digits, one or zero. The general form for a binary number is therefore:

$$D_{n-2}\times2^{n-1}+\ldots\ldots D_2\times D^2+D_1\times2^1+D_0\times2^0$$
$$D_{n-1}\times2^{n-1}+\ldots\ldots D_2\times4+D_1\times2+D_0\times1$$

Let us consider an example, the number %101. (The % sign is the conventional sign to represent binary). As with all numbers, the right hand digit is the smallest. By convention this is called bit zero. The next left bit is bit one and the leftmost bit is bit two (bit=binary digit). You will have noticed (you did, didn't you?) that the bit number equates to the corresponding power of two. So our example becomes:

%101 = 1× + 0×2 + 1×1 = 5

Here is an eight bit number -%11001100. This is equivalent to:

$$\%11001100 = 1\times2^7 + 1\times2^6 + 0\times2^5 + 0\times2^4 + 1\times2^3 + 1\times2^2 + 0\times2^1 + 0\times2^0$$

which equals 128+64+8+4 = 204.

From this you should be able to prove for yourself that the largest number than an eight bit register can hold is %11111111 or 255.

For our sins, we humans cannot think easily in binary. I find decimal tough enough but binary...forget it. You need to know binary for the purpose of manipulating specific bits but that's about all. A more convenient system is to use the base 16 – the hexadecimal system. In this system, any eight bit number occupies just two digits and any sixteen bit number just four digits. As you will find, this makes life easier although you may not believe me at the moment.

If we apply N=16 to our general expression we get:

$$\text{Decimal value} = D_3\times16^3 + D_2\times16^2 + D_1\times16^1 + D_0\times16^0 \text{ or}$$
$$D^3\times4096 + D_2\times256 + D_1\times16 + D_0$$

Consider the number $0016. There are three features to note:

1) As for binary, we prefix hexadecimal with a character so that we know what base is in use. In the case of hexadecimal, we use $. Some systems, particularly users of Z80 machines, use &H.
2) Although the number only needs two digits, the two most significant digits are shown as zeros.
3) If we are counting in groups of 16, how do we represent the numbers 10 through to 15?

The answer is that we pinch some alphabet characters thus:

A = 10
B = 11
C = 12
D = 13
E = 14
F = 15

So $0016 = 0×4096 + 0×256 + 1×16 + 6 i.e. $0016 = 24

Similarly, consider $10AB.
$10AB = 1×4096 + 0×256 + 10×16 + 11 = 4267 (A=10, B=11....remember?)

Again, you should be able to verify that the largest numbers which can be held in eight and 16 bits are:
eight bits...%11111111 = $00FF = 255
sixteen bits..%1111111111111111 = $FFFF = 65535

Finally, to help link what you've learned to what you should seek in an assembler, here is an imaginary piece of assembled source code:

```
100: C000                                *=$C000
110: AB1E                   PMESS        =$AB1E
120: ;
130: C000 A9 01                          LDA # %00000001
140: C002 8D 86 02                       STA 646
150: C005 A9 00                          LDA # $00
160: C007 8D 20 D0                       STA $D020
170: C00A 8D 21 D0                       STA $D021
180: C00D A9 15                          LDA #<MESSAGE
190: C00F A0 C0                          LDY # >MESSAGE

200: C011 20 1E AB                       JSR PMESS
210: C014 64                             RTS
220: C015 48 45 4C          MESSAGE      .ASC "HELLO"
230: C01A 00                             .BYTE $00
C000-C01B
```

This is a composite of several assemblers but gives the general features. The first column of numbers is the line numbers used by the editor. The second column shows the addresses occupied by the assembled code. The next three hexadecimnal bytes are the actual machine code. The next column holds labels and the last column holds the mnemonics which assist writing the program. Don't worry about the details at the moment, things will be clearer in the next part of the series. Just note two things:
1. I've deliberately used binary, decimal and hexadecimal to show their interchangeability in a decent assembler.
2. You should aim to get an assembler which offers the facilities shown.

Because I'm a fundamentally nasty person, here is your homework.
1. Write the decimal numbers zero to inclusive in binary.
2. Perform the following conversions.
%10101010 to decimal
123 to binary
%111101111 to decimal
$4100 to decimal.
1123 to hexadecimal
3. For those of you who want to try a small program, write a program in Basic which will accept a binary number and convert it to decimal.

Well, that's all for this time. To help you with your searches for software, here are some addresses.

Touch Line

Supersoft: Winchester Hs, Canning Rd, Wealdstone, Harrow, Middlesex. Tel 01 861 1166

First Publishing: Unit 20B, Horseshoe Rd, Pangbourne, Berks. Tel 07357 5244

Oasis Software: Walliscote Rd, Weston-Super-Mare, Avon, BS23 Tel 0934 419921.

Dr Watson Assembly Language series – Glen Tp Publishers Ltd, Standfast House, Bath Place, High Street, Barnet, Herts EN5 1ED.

DISK DELVING

Stuart Cooke explains how to make changes to your floppy disks.

HOW OFTEN HAVE YOU scratched your latest programming masterpiece from your disk only to realise a few moments later that you didn't have a back up?

No doubt up until now the only option open to you was to retype the whole program from the beginning.

A little more understanding of how the 1541 disk drive works would enable you to rescue most scratched programs and make numerous other changes to your disk directories.

Before you start playing around with the contents of your floppy disks it is important that you understand exactly how information is stored on them. If you don't and you start changing areas of a disk you can probably wave bye-bye to the contents of the whole thing.

In order to make any changes to a disk you will require access to some sort of disk monitor program. This is a program that will allow you to examine the contents of any areas on a disk and make changes to them. There are many disk editors available on the market and an extremely comprehensive one was published in the January 1986 issue of Your Commodore.

Disk Structure

Any new disk must be formatted before it can be used by the 1541 disk drive. Formatting a disk divides it into 35 circular rings called tracks. Each of these tracks is then split up further into a number of equal sized segments called sectors. Each track contains between 17 and 21 sectors. Figure 1 shows this is a little more clearly. As you can see from the diagram the number of sectors is smaller towards the centre of the disk because each track is shorter.

How Much Room?

In the centre of the disk on track 18 you will find the disk information track. Track 18 is used to keep all necessary in-

Figure 1: 1541 disk format

TRACK	NUMBER OF SECTORS
1 to 17	21
18 to 24	19
25 to 30	18
31 to 35	17

Figure 2: 1541 BAM

TRACK 18 SECTOR 0

BYTE	CONTENTS	
0,1	$12,$01	Holds track and sector number of the 1st directory entry
2	$41	Letter 'A' this indicates 1541 format
3	$00	For future use
4-143		Map of showing free and allocated blocks 1 = Free block, 0 = used

Figure 3: Structure of BAM of a track

BYTE	CONTENTS
0	Number of available blocks in this track
1	Bit map of sectors 0 to 7
2	Bit map of sectors 8 to 15
3	Bit map of sectors 16 to 23

Figure 4: Format of directory header

TRACK 18 SECTOR 0

BYTE	CONTENTS	
144-161		Name of disk
162,163		ID of disk
164	$A0	A shifted space
165,166	$32,S41	Characters '2A' this is the format of the disk
167-170	$A0	Shifted space
171-255	$00	Not used

formation about programs; where they are stored and how much room is free.

The first sector of track 18 is used to record which sectors of the disk have been used. This record is called the Block Availability Map or BAM. Every time you make any changes to the contents of your disk the BAM is examined so that the disk drive can find out where it can store information. The BAM is updated every time you save or scratch a file from the disk. Figure 2 shows the contents of the first part of track 18.

Figure 2 shows that bytes four to 143 of track 18 sector zero hold the BAM. Four consecutive bytes are used to represent the BAM for each track Figure 3 shows exactly how the information is stored.

As you are no doubt aware, a single byte can hold a number up to 255 or 11111111 in binary. From the binary representation it can be seen that each byte can store the information for eight tracks. Each digit representing one sector. A one would tell you that the sector had been used while a zero would tell you that it was still free. For example 11111100 means that six sectors had been used.

The first byte of each group of four holds the actual number of sectors available on the relevant track. Don't forget the number of sectors gets smaller towards the centre of the disk.

Disk Info

Bytes 144 to 255 of track 18 sector zero are used to hold all the disk information. This is the information which is printed out at the top of each directory listing. Figure 4 shows exactly what information is held on this section of the disk. If you wanted to change the title or ID of a disk then it would be a simple matter to read this information into your computer using your disk monitor, make the necessary changes and then rewrite the information back to the disk.

Directory Info

The sectors from one upwards on track 18 are used to hold the file names and information relating to any program you have stored on disk. Each sector is referred to as a directory block and will hold the information for about eight files. The first two bytes of each block are used to give the track and sector of the next directory block. Figure 5 shows how each directory block is laid out. If there is no more directory information then these two bytes will hold zero.

Each of the eight program entries in each directory block is made up of 30 bytes. These are the ones that hold the information about the type of file; where it is held etc. Figure 6 shows the exact use of each of the 30 bytes.

The first byte of each program entry is used to hold the file type. If you have a look at Figure 7 you will see that there are five different types of file that can be represented. However this byte gives more information than you may at first realise.

Bits zero to two are used to indicate which of the five types of file we are looking at. Bit seven is used to tell the drive if the file is properly closed or if the file is still open. A one indicates that the file is open. An open file can be seen on a directory listing with an '*' beside the file type.

Bit six holds a very important piece of information and a large number of people are unaware of this. It is used to tell the disk drive whether or not the file is protected. Setting this bit to a '1' will prevent you

Figure 5: Format of the directory

TRACK 18 SECTOR 1

BYTE	CONTENTS
0,1	Track and sector of next directory block
2-31	Entry of 1st file
34-63	Entry of 2nd file
66-95	Entry of 3rd file
98-127	Entry of 4th file
130-159	Entry of 5th file
162-191	Entry of 6th file
194-223	Entry of 7th file
226-255	Entry of 8th file

Figure 6: Format of directory entries

Each file entry consists of the following 30 bytes

BYTES	CONTENTS
0	Type of file
1,2	Track and sector of 1st block of data
3-18	Filename, padded with shifted space
19,20	Track and sector of 1st side sector block (used with REL files)
21	Record length (used with REL files)
22-25	Not used
26,27	Track and sector of file when overwritten by saving a file with @
28,29	Number of blocks in the file

Figure 7: The type of file

FILE TYPE	FILE OPEN	FILE CLOSED
DELETED	0000 0000 $00	1000 0000 $80
SEQUENTIAL	0000 0001 $01	1000 0001 $81
PROGRAM	0000 0010 $02	1000 0010 $82
USER	0000 0011 $03	1000 0011 $83
RELATIVE	0000 0100 $04	1000 0100 $84

deleting the file by normal methods. A protected file can be seen on a directory listing with a '<' by the side of the program type. If you have any important files it is well worth going to the trouble of setting this bit to prevent accidental erasure.

Program Erasure

Whenever you delete a program from disk a number of changes are made to the disk. Firstly, the sectors that the program occupied are marked as being free in the BAM and, secondly, the file type is changed to a zero indicating that it has been deleted. The important thing to remember is that the program is still on disk and will remain there until another program is saved over it, probably after the next SAVE.

Figure 8

```
 Steve's Disk Editor. 'test@@@@@@@@@@@@'

 Track:12 18  Lnk:12 18   Printer port:s
Sector:00 0        01 1   Device:8  Dr:0
 Posn.:FF 255  Data: 0    Number base:d

Command:

CA80: 11 FF FF 01 11 FF FF 01 '........'
CA88: 11 FF FF 01 11 FF FF 01 '........'
CA90: 54 45 53 54 A0 A0 A0 A0 'test....'
CA98: A0 A0 A0 A0 A0 A0 A0 A0 '........'
CAA0: A0 A0 59 43 A0 32 41 A0 '..yc.2a.'
CAA8: A0 A0 A0 00 00 00 00 00 '........'
CAB0: 00 00 00 00 00 00 00 00 '........'
CAB8: 00 00 00 00 00 00 00 00 '........'
CAC0: 00 00 00 00 00 00 00 00 '........'
CAC8: 00 00 00 00 00 00 00 00 '........'
CAD0: 00 00 00 00 00 00 00 00 '........'
CAD8: 00 00 00 00 00 00 00 00 '........'
CAE0: 00 00 00 00 00 00 00 00 '........'
CAE8: 00 00 00 00 00 00 00 00 '........'
CAF0: 00 00 00 00 00 00 00 00 '........'
CAF8: 00 00 00 00 00 00 00 00 '........'
```

Figure 9

```
 Steve's Disk Editor. 'test@@@@@@@@@@@@'
00, ok,00,00
 Track:12 18  Lnk:12 18   Printer port:s
Sector:00 0        01 1   Device:8  Dr:0
 Posn.:80 128  Data: 17   Number base:d

Command:

CA80: 11 FF FF 01 11 FF FF 01 '........'
CA88: 11 FF FF 01 11 FF FF 01 '........'
CA90: 44 45 4D 4F A0 A0 A0 A0 'demo....'
CA98: A0 A0 A0 A0 A0 A0 A0 A0 '........'
CAA0: A0 A0 59 43 A0 32 41 A0 '..yc.2a.'
CAA8: A0 A0 A0 00 00 00 00 00 '........'
CAB0: 00 00 00 00 00 00 00 00 '........'
CAB8: 00 00 00 00 00 00 00 00 '........'
CAC0: 00 00 00 00 00 00 00 00 '........'
CAC8: 00 00 00 00 00 00 00 00 '........'
CAD0: 00 00 00 00 00 00 00 00 '........'
CAD8: 00 00 00 00 00 00 00 00 '........'
CAE0: 00 00 00 00 00 00 00 00 '........'
CAE8: 00 00 00 00 00 00 00 00 '........'
CAF0: 00 00 00 00 00 00 00 00 '........'
CAF8: 00 00 00 00 00 00 00 00 '........'
```

If you delete a file by accident and realised before you have saved another to disk then it is a very simple matter to retrieve it. All you have to do is find an entry for the file in the directory block and change the file type to whatever it was before. For example, if it was a program you would change the zero to 02. Your program will now be rectified. However, the BAM will not be updated and if you save any other programs to this disk you stand a very good chance of overwriting your program. Therefore, make sure that you copy the rescued file onto a new disk.

Tutorial

It is probably worth going through a short tutorial to illustrate some of the changes that can be made. All examples are demonstrated with the disk editor that appeared in the January issue of Your Commodore.

Firstly, you will need to format a new disk with the following command:

```
OPEN1,8,15,"NO:TEST,YC"
```

Please make sure that the disk is blank before you enter the above command as it will wipe your disk of all information.

Next, type in the following small program and SAVE it to disk with the filename 'ONE':

```
10 REM THIS IS A VERY
20 REM SHORT TEST
30 REM PROGRAM
40 REM
50 REM THE END
```

OK, so it's nothing stunning but it will serve our purpose very well.

Now LOAD your disk editor program and examine the contents of track 18 sector zero. If you have a look at bytes 144 to 161 you will see that they hold the name of the disk, Figure 8 shows what you should see. Now we shall change the disk name.

Change the letters of the file name to 'DEMO'. Figure 9 gives an example of how your disk should look now.

Now write the sector back to your disk with the write command and your changes will have been made per-

Figure 10

```
 Steve's Disk Editor. 'test@@@@@@@@@@@@'

 Track:12 18  Lnk:00 0    Printer port:s
Sector:01 1       FF 255  Device:8  Dr:0
 Posn.:02 2    Data: 0    Number base:d

Command:

CA00: 00 FF [00] 11 00 4F 4E 45 '.....one'
CA08: A0 A0 A0 A0 A0 A0 A0 A0 '........'
CA10: A0 A0 A0 A0 A0 00 00 00 '........'
CA18: 00 00 00 00 00 00 01 00 '........'
CA20: 00 00 00 00 00 00 00 00 '........'
CA28: 00 00 00 00 00 00 00 00 '........'
CA30: 00 00 00 00 00 00 00 00 '........'
CA38: 00 00 00 00 00 00 00 00 '........'
CA40: 00 00 00 00 00 00 00 00 '........'
CA48: 00 00 00 00 00 00 00 00 '........'
CA50: 00 00 00 00 00 00 00 00 '........'
CA58: 00 00 00 00 00 00 00 00 '........'
CA60: 00 00 00 00 00 00 00 00 '........'
CA68: 00 00 00 00 00 00 00 00 '........'
CA70: 00 00 00 00 00 00 00 00 '........'
CA78: 00 00 00 00 00 00 00 00 '........'
```

manent. If you want to check this for yourself reset your machine and load in the disk directory, you will see that the name has been changed.

Now we are going to delete a file and then recover it. Delete the test file from your disk with the following command:

OPEN1,8,15,"S0:ONE"

If you now try to LOAD the file you will be unable to do so.

LOAD in your disk editor and take a look at track 18 sector one. Since 'ONE' is the first program on disk this is where it will be saved.

Figure 10 shows how your display should look. The '00' byte which indicates a scratched file has been highlighted. Now change this number to '02' and save the sector back to disk.

If you now reset your machine you should find that the example program will now load in correctly. Don't forget that if you save any more programs to that disk the recovered file will probably be deleted.

PROGRAMMER OF THE YEAR

commodore

Kung Fu Masters from William Fong is this month's entry for the competition.

THERE ARE A NUMBER OF Kung Fu programs available on the market. Even though Kung Fu Masters from William Fong lacks some of the polish of its commercial counterparts it is still an excellent game and is well worth the effort to type in.

As you progress through the numerous levels of this program you will meet a number of adversaries. The first is a very small and very easily defeated Kung Fu master. Next you have to face the stick lady who is intent on battering you around the head and ankles with a rather large piece of wood. Then, well I'll leave it up to you to find out as no one in the office has managed to get past this level.

Kung Fu Masters is a very well presented program with full instructions and a practice option included.

Getting It All In

Kung Fu Masters comprises three programs. The first is a loader program which is used to set up your C64 and load in the final two parts. Don't forget to change '8,1' to '1,1' where indicated if you are using tape instead of disk.

The three programs should be stored in this order.

KUNG FU LOADER
KUNG FU MASTERS1
KUNG FU MASTERS2

KUNG FU MASTERS2 is a machine code program and you must use the Easy Entry program to be found elsewhere in this issue to enter the program. When you save KUNG FU2 you should save it after KUNG FU MASTERS1 with the file name 'KUNG FU MASTERS2' and it must be saved with a start address of 8192 and an end address of 12626.

The Easy Entry program will check each line as you enter it leaving little room for mistakes.

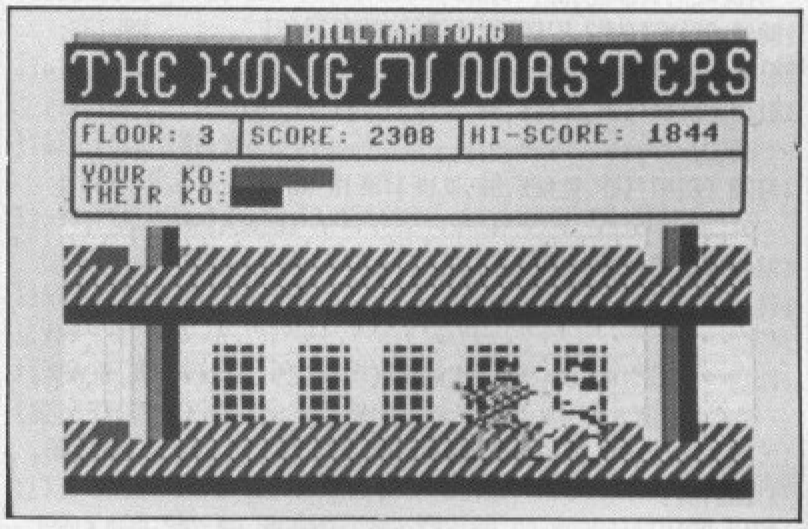
PROGRAM: KUNG FU LOADER

```
100 REM **********************************
110 REM *[SPC3]KUNG FU LOADER PROGRAM[SPC5]*
120 REM *[SPC5]WILLIAM FONG 1985[SPC8]*
130 REM **********************************
140 POKE 43,1:POKE 44,16*4:POKE 54,3:POKE 46,16*4
   :POKE 16*1024,0
150 PRINT"[CLEAR]NEW":PRINT"[DOWN2]LOAD"+CHR$(34)+"KUNG
    FU MASTERS1"+CHR$(34)+",8"
160 REM ** CHANGE THE ,8 IN ABOVE LINE TO ,1 IF YOU ARE
    USING TAPE **
170 PRINT "[DOWN4]RUN"
180 POKE 631,13:POKE 632,13:POKE 633,13:POKE 198,3
   :PRINT"[HOME]"
```

PROGRAM: KUNG FU MASTERS1

```
5 IF A>0 THEN 110
10 POKE 53281,2:POKE 53280,2
85 PRINT"[CLEAR,DOWN6,YELLOW,SPC4]THE KUNG FU MASTERS IS
    LOADING..[DOWN4]"
87 PRINT"[SPC4]PROGRAM WRITTEN BY WILLIAM FONG[DOWN3]"
95 PRINT"[SPC4,BLACK]PLEASE WAIT FOR A FEW SECONDS..."
102 A=A+1:IF A=1 THEN LOAD"KUNG FU MASTERS2",8,1
109 REM**VARI**
110 V=53248:T1=9:T2=0:W1=0:W2=1:PE=147:MD=2:SR=1:Q1=0:Q2=0
   :S=1
120 X1=100:X2=200:Y1=185:Y2=185
130 I2=54283:A2=54284:H2=54280:L2=54279
140 I3=54290:A3=54291:H3=54287:L3=54286
299 REM**INTIALISATION**
300 POKE V+21,255:POKE V+23,255:POKE V+29,255:POKE 54296,15
310 POKE V+28,255:POKE V+37,0:POKE V+38,7
320 POKE V+40,3:POKE V+41,4:POKE 2041,128:POKE 2040,192
   :POKE 2042,147
330 POKE 2043,157:POKE 2044,165:POKE 2045,174:POKE 2046,183
340 POKE V+42,10:POKE V+43,11:POKE V+44,5:POKE V+45,13
490 GOTO 11000
499 REM**MAIN**
500 GOSUB 600:GOSUB 830
550 GOSUB 950:GOSUB 1000
590 GOTO 500
599 REM**PLAYER**
600 P=1:A=PEEK(56320):IF A=127 THEN RETURN
650 IF A=123 THEN T1=0:GOSUB 800:GOSUB 820:RETURN
660 IF A=119 THEN T1=9:GOSUB 800:GOSUB 840:RETURN
670 IF A=122 THEN POKE 2041,135+T1:GOTO 760
675 IF A=111 THEN POKE 2041,136+T1:GOTO 760
680 IF A=125 THEN POKE 2041,132+T1:GOTO 760
690 IF A=121 THEN POKE 2041,131+T1:GOTO 760
700 IF A=117 THEN POKE 2041,133+T1:GOTO 760
710 IF A=118 THEN POKE 2041,134+T1:GOTO 760
720 IF A=126 THEN GOSUB 850:GOSUB 800:RETURN
760 GOSUB 11600:GOSUB 1200:RETURN
790 RETURN
799 REM**WALK1**
800 IF W1=0 THEN POKE 2041,128+T1:W1=1:RETURN
810 POKE 2041,129+T1:W1=0:RETURN
819 REM**LEFT1**
820 IF X1>20 THEN X1=X1-10:RETURN
825 RETURN
829 REM**POKE**
830 POKE V+2,X1:POKE V+3,Y1:RETURN
839 REM**RIGHT1**
840 IF X1<245 THEN X1=X1+10:RETURN
```

```
845 RETURN
849 REM**JUMP**
850 IF T1=9 THEN 900
860 POKE 2041,130:FOR N=1 TO 8:GOSUB 820:Y1=Y1-7:GOSUB 830
870 IF J=1 THEN GOSUB 970
875 NEXT
880 FOR N=1 TO 8:GOSUB 820:Y1=Y1+7:GOSUB 830
890 IF J=1 THEN GOSUB 970
895 NEXT:GOSUB 960:RETURN
900 POKE 2041,139:FOR N=1 TO 8:GOSUB 840:Y1=Y1-7
910 GOSUB 830:IF J=1 THEN GOSUB 970
915 NEXT
920 FOR N=1 TO 8:GOSUB 840:Y1=Y1+7:GOSUB 830
930 IF J=1 THEN GOSUB 970
932 NEXT:GOSUB 960:RETURN
935 REM**POKE2**
940 POKE V+4,X2:POKE V+5,Y2:RETURN
945 REM**WALK2**
950 IF W2=1 THEN POKE 2042,PE+1+T2:W2=0:RETURN
955 POKE 2042,PE+T2:W2=1:RETURN
959 REM**PEEK**
960 CS=PEEK(V+30):RETURN
965 REM**MOVE2**
970 IF X1<X2 THEN X2=X2-5:T2=0:GOTO 980
975 X2=X2+5:T2=2+MO
980 GOSUB 950:GOSUB 940:RETURN
999 REM**OTHER**
1000 IF X2<X1-10 AND X2<245 THEN X2=X2+6:T2=4
   :IF X1-X2>60 THEN GOSUB 940:GOSUB 950:RETURN
1030 IF X2>X1+10 AND X2>20 THEN X2=X2-6:T2=0
   :IF X2-X1>60 THEN GOSUB 940:GOSUB 950:RETURN
1040 GOSUB 940
1050 IF INT(RND(1)*LV)>1 THEN RETURN
1100 POKE 2042,INT(RND(1)*MO)+PE+2+T2
1150 GOSUB 1400
1190 RETURN
1199 REM**HIT HIM**
1200 GOSUB 960:IF CS<>255 OR J=0 THEN RETURN
1203 GOSUB 11620
1205 Y3=Y2-10:IF A=125 OR A=117 THEN Y3=Y2+15:GOTO 1220
1210 IF A=121 OR A=118 THEN Y3=Y2+5
1220 Q2=Q2+1:POKE V+39,1:POKE V,X2+5:POKE V+1,Y3
   :SC=SC+PEEK(2041)-100
1225 PRINT"[HOME,DOWN5,RIGHT17,RVSOFF,BLACK]"SC
1230 PRINT"[DOWN2,RIGHT10,BLACK]";:FOR N=1 TO Q2
   :PRINT"[RVSON,SPC,RVSOFF]";:NEXT
1240 POKE V+1,0:POKE V,0
1250 IF T2<>0 THEN 1300
1260 FOR N=1 TO 5:IF X2<245 THEN X2=X2+10:GOSUB 940:NEXT
   :IF X2>240 THEN X2=20
1290 GOTO 1310
1300 FOR N=1 TO 5:IF X2>20 THEN X2=X2-10:GOSUB 940:NEXT
   :IF X2<20 THEN X2=255
1310 :
1380 GOSUB 960:GOSUB 800
1385 IF Q2=29 THEN 1620
1390 RETURN
1399 REM**HIT ME**
1400 GOSUB 11610:GOSUB 960:IF CS<>255 THEN RETURN
1420 GOSUB 11620:Q1=Q1+1:POKE V+39,2:POKE V,X1+5
   :POKE V+1,Y1
1430 PRINT"[HOME,DOWN7,RIGHT10,BLUE]";:FOR N=1 TO Q1
   :PRINT"[RVSON,SPC,RVSOFF]";:NEXT
1440 FOR N=1 TO 50:NEXT:POKE V+1,0:POKE V,0
1450 IF X2>X1 THEN 1500
1460 FOR N=1 TO 5:IF X1<245 THEN X1=X1+10:GOSUB 830:NEXT
1490 GOTO 1510
1500 FOR N=1 TO 5:IF X1>20 THEN X1=X1-10:GOSUB 830:NEXT
1510 IF Q1=29 THEN 1700
1580 GOSUB 960:GOSUB 800
1590 RETURN
1599 REM**WHICH SC**
1600 IF SR=6 THEN 11700
1605 ON SR GOSUB 10400,10500,10600,10700,10800
1610 SR=SR+1:IF SR>S THEN S=SR
1612 RETURN
1615 REM**HIM DEAD**
```




```
1620 IF SR=2 THEN POKE 2042,155
1622 IF SR=3 THEN POKE 2042,164
1624 IF SR=4 THEN POKE 2042,173
1626 IF SR=5 THEN POKE 2042,182
1630 IF SR=6 THEN POKE 2042,191
1640 FOR N=1 TO 1000:NEXT
1670 T1=0:GOSUB 820:GOSUB 830:GOSUB 800:IF X1>20 THEN 1670
1680 POKE V+2,0:POKE V+3,0:POKE V+4,0:POKE V+5,0:GOSUB 1600
1690 GOTO 500
1695 REM**ME DEAD**
1700 POKE 2041,146:FOR N=1 TO 500:NEXT:T2=0
1710 X2=X2-5
1715 GOSUB 940:GOSUB 950:IF X2>10 THEN 1710
1720 POKE V+4,0:POKE V+5,0:FOR N=1 TO 1500:NEXT
1730 POKE 53281,2:POKE 53280,2
1740 PRINT"[CLEAR,BLACK,DOWN7,SPC6,SU,SC2,SI,SU,SC2,SI,SU,
   SC2,SI,SU,SC,CR,SC,SI,SU,SC2,SI2,SPC2,SU]"
1750 PRINT"[SPC6,SB,SPC2,SB2,SPC3,SB,SPC2,SB,SPC2,SB,SPC2,
   SB,SPC3,SB,SPC2,SB]"
1760 PRINT"[SPC6,CQ,SC2,SI,CQ,SC2,SPC,CQ,SC2,CW,SPC2,SB,
   SPC2,CQ,SC2,SPC,SB,SM,SPC,SB]"
1770 PRINT"[SPC6,SB,SPC2,SB2,SPC3,SB,SPC2,SB,SPC2,SB,SPC2,
   SB,SPC3,SB,SPC,SM,SB]"
1790 PRINT"[SPC6,SJ,SC2,SK,SJ,SC2,SK2,SPC2,SJ,SPC2,SK,SPC2,
   SJ,SC2,SK2,SPC2,SJ,SC4,SI]"
1800 PRINT"[SPC,SU,SC33,SK]"
1820 FOR N=1 TO 2000:NEXT:IF SC>HI THEN HI=SC
```

```
1830 POKE V+2,0:POKE V+3,0:POKE 2041,128
1890 SC=0:SR=1:GOTO 11000
9999 REM**DISPLAY**
10000 POKE 53281,14:POKE 53280,14
10005 PRINT"[CLEAR,RED,RVSOFF,CD,CI12,RVSON,BLUE,SPC]
  WILLIAM FONG[SPC,RED,RVSOFF,CI12,CF]"
10010 PRINT"[UP,RVSON,BLACK,SU,CR,SI2,SU2,SI,SPC,SI,SU3,SI,
  SPC,SU2,SI,SPC,SU,SC,SI,SU,SPC,SU,SI,SU,SI,SU,SI,SU,SI,
  SU,CR,SI,SU,SI,SU,SI,SU,SI]"
10020 PRINT"[UP,RVSON,BLACK,SPC,SB,SPC,CQ,CW,CQ,SPC2,CQ,
  SPC,SB3,SM,SB2,CR,SPC,CQ,SPC,SB2,SPC,SB4,CQ,CW,SJ,SI,
  SPC,SB,SPC,CQ,SPC,CQ,SK,SJ,SI]"
10030 PRINT"[UP,RVSON,BLACK,SPC,SK,SPC,SK,SJ2,SK,SPC,SK,
  SJ2,SK2,SPC,SJ2,SK,SPC,SK,SPC,SJ,SK,SPC,SK,SJ,SK,SJ,SK,
  SJ2,SK,SPC,SK,SPC,SJ,SK2,SJ2,SK]"
10040 PRINT"[UP,BLACK,SU,SC9,CR,SC12,CR,SC15,SI]"
10050 PRINT"[UP,BLACK,SB,BLUE]FLOOR[BLACK]
  :[SPC3,SB,BLUE]SCORE[BLACK]:[SPC6,SB,BLUE]HI-SCORE
  [BLACK]:[SPC6,SB]"
10060 PRINT"[UP2,RIGHT7]"SR"[RIGHT23]"HI
10100 PRINT"[BLACK,CQ,SC9,CE,SC12,CE,SC15,CW]"
10110 PRINT"[UP,BLACK,SB,BLUE]YOUR[SPC2]KO
  :[C3]------------------------------[BLACK,SB]"
10120 PRINT"[UP,BLACK,SB,BLUE]THEIR KO
  :[C3]------------------------------[BLACK,SB]"
10160 PRINT"[UP,BLACK,SJ,SC38,SK]"
10190 RETURN
10200 :
10210 PRINT"[RVSON,C8,UP,CR,CE,CR,CE,C5,SPC,C4,SPC,BLACK,
  SPC,C8,CR2,CE,CR,CE,CR,CE,CR,CE,CR,CE2,CR,CE,CR,CE2,CR,
  CE,CR,CE,CR,CE,CR,CE,CR,CE,C5,SPC,C4,SPC,BLACK,SPC,C8,
  CR2,CE]"
10212 PRINT"[RVSON,C2,UP,SN2,SPC2,C5,SPC,C4,SPC,BLACK,SPC,
  C2,SN27,C5,SPC,C4,SPC,BLACK,SPC,C2,SN3]"
10215 FOR N=1 TO 2:PRINT"[C2,UP,RVSON,SN40]":NEXT
10220 PRINT"[UP,BLACK,RVSON,SPC40]"
10230 FOR N=1 TO 5:PRINT"[RVSON,C8,UP,CR,CE,CQ,CW,C5,SPC,
  C4,SPC,BLACK,SPC,C8,CR2,CE,CR,CE,CR,CE,CR,CE,CR,CE3,CR,
  CE,CR,CE,CR3,CE,CR,CE,CR,CE,CR,CE,C5,SPC,C4,SPC,BLACK,
  SPC,C8,CR2,CE]"
10240 NEXT
10290 PRINT"[RVSON,C2,UP,SN2,SPC2,C5,SPC,C4,SPC,BLACK,SPC,
  C2,SN27,C5,SPC,C4,SPC,BLACK,SPC,C2,SN3]";
10300 FOR N=1 TO 2:PRINT"[C2,RVSON,SN40]";:NEXT
10310 PRINT"[BLACK,RVSON,SPC40]";
10340 PRINT"[UP9]"
10390 RETURN
10399 REM**SC1**
10400 GOSUB 10000:GOSUB 10200:Q1=0:Q2=0:LV=15:SC=0:PE=147
  :MO=2:X2=255
10420 PRINT"[BLACK,RVSON,RIGHT8,SB3,RIGHT4,SB3,RIGHT5,SB3,
  RIGHT3,C4]: :[RIGHT7]";
10430 FOR N=1 TO 3:PRINT"[RVSON,RIGHT30,C4]: :[RIGHT7]";
  :NEXT
10490 RETURN
10495 REM**SC2**
10500 Q1=0:Q2=0:PE=156:LV=10:GOSUB 10000:GOSUB 10200:X2=255
  :POKE V+41,10
10510 PRINT"[RED,RVSON,RIGHT9,SU,SC,SI,SU,CR,SI2,SU,SC,SI2,
  SU,SPC,SU,SC,SI2,SU,SC,SI2,SPC2,RIGHT8]";
10520 PRINT"[RED,RVSON,RIGHT9,SJ,SC,SI,SPC,SB,SPC,SB2,SPC2,
  CQ,SPC2,SB,SPC,CS,SB,CQ,SC,SK,SB,SPC2,RIGHT8]";
10530 PRINT"[RED,RVSON,RIGHT9,SJ,SC,SK,SPC,SK,SPC,SJ2,SC,
  SK2,SJ,SPC,SJ,SC,SK3,SJ,SPC,SJ,SC,SK,RIGHT8]";
10590 RETURN
10595 REM**SC3**
10600 Q1=0:Q2=0:PE=165:LV=5:GOSUB 10000:GOSUB 10200:X2=255
  :POKE V+41,4
10620 FOR N=1 TO 4:PRINT"[RIGHT9,RVSON,S+3,RIGHT2,S+3,
  RIGHT2,S+3,RIGHT2,S+3,RIGHT2,S+3,RIGHT8]";:NEXT
10690 RETURN
10695 REM**SC4**
10700 Q1=0:Q2=0:PE=174:LV=3:GOSUB 10000:GOSUB 10200:X2=255
  :POKE V+41,5
10710 PRINT"[UP,WHITE,RIGHT7,CI,CO,CP3]ת[CP,CO,CI,CO,CP5]
  תת[YELLOW,SQ,WHITE,SPC6]ת[CP,CO,RIGHT3,CI,CO,CP]";
10715 PRINT"[WHITE,RVSON,RIGHT7,SPC17,CT,CY,CU3,RVSOFF,CI,
  CO,CP2,CO,RIGHT3,CP]ת ";
10720 PRINT"[BLACK,RIGHT7,CR27,RIGHT3,CR3]";
10730 PRINT"[BLACK,RIGHT7,SB27,RIGHT3,SB3]";
10740 PRINT"[RVSON,C2,RIGHT7,SN27,RIGHT3,SN3]";
10790 RETURN
10795 REM**SC5**
10800 Q1=0:Q2=0:PE=183:LV=0:GOSUB 10000:X2=255:MO=2
  :POKE V+41,5:Y1=170:Y2=Y1
10810 PRINT"[UP,WHITE,CI,CO,CP2,CO,CI,CO,CP3,CO,CI2,CO2,
  CP3,CO,CP2]תתת[SPC8]ת[CP]ת[CP,CO2,CI2,CO]";
10820 PRINT"[RVSON,SPC23,CT,CY,CU,CY,CU2,RVSOFF,CI,CO,CP,
  CT,CY,CU,CY,CU2,CT,CU]";
10830 PRINT"[CY,CU,CT,CY,CU,CY,CU3,CY,CT,CY,CT,CY2,CT,CY,
  CT,CY5,CT2,CY2,CT3,CY3,CT2,CY,CT2,CY,CT]";
10840 PRINT"[CO2,CI,CO2,CP]תת[CP]ת[SPC14]ת[CP,CO2,CP3,CO,
  CP4]תת[SPC2]"
10850 FOR N=1 TO 4:PRINT"[BLACK,S+35,C8,RVSON,CE,CR,CE,CR,
  CE,RVSOFF]";:NEXT
10860 FOR N=1 TO 3:PRINT"[C2,RVSON,SN40]";:NEXT
10865 PRINT"[BLACK,RVSON,SPC40]";
10870 PRINT"[RVSON,C8,CR,CE,CR,CE,C5,SPC,C4,SPC,BLACK,SPC,
  C8,CR2,CE,CR,CE,CR,CE,CR,CE,CR,CE2,CR,CE,CR,CE2,CR,CE,
  CR,CE,CR,CE,CR,CE,CR,CE,C5,SPC,C4,SPC,BLACK,SPC,C8,CR2,
  CE]";
10990 RETURN
10995 REM**WHICH FIGHTER**
11000 POKE 53281,5:POKE 53280,5:SYS 12352
11010 PRINT"[CLEAR,BLACK,SU,SC,CR,SC,SI2,SPC2,SU2,SC3,SI]"
11020 PRINT"[SPC2,SB,SPC2,CQ,SC2,CW,CQ,SC2,SPC11]WILLIAM
  FONG"
11030 PRINT"[SPC2,SK,SPC2,SK,SPC2,SJ2,SC7,SK]"
11040 PRINT"[SU,SC2,SI,SC,SI,SU,SC2,SI,SU,SC2,SI,SU,SC,CR,
  SC,SI,SU,SC2,SI,SU,SC2,SI,SU,SC2,SI]"
11050 PRINT"[SB,SPC2,SB]&[SB,CQ,SC2,CW,SJ,SC2,SI,SPC2,SB,
  SPC2,CQ,SC,SPC2,CQ,SC2,SK,SJ,SC2,SI]"
11060 PRINT"[SK,SPC4,SJ,SK,SPC2,SJ2,SC2,SK,SPC2,SK,SPC2,SJ,
  SC2,SK2,SJ,SC,SK,SJ,SC2,SK]ATTACKED"
11070 PRINT"[SU,SC38,SI]";
11090 FOR I=1 TO 2
11100 PRINT"[SB,SPC,SU,SC8,SI,SPC3,SU,SC8,SI,SPC3,SU,SC8,
  SI,SPC,SB]";
```

```
11110 FOR N=1 TO 6:PRINT"[SB,SPC,BLACK,SB,RVSON,BLUE,SPC8,
  RVSOFF,BLACK,SB,SPC3,SB,BLUE,RVSON,SPC8,BLACK,RVSOFF,SB,
  SPC3,SB,RVSON,BLUE,SPC8,RVSOFF,BLACK,SB,SPC,SB]";
11115 NEXT
11120 PRINT"[SB,SPC,SJ,SC8,SK,SPC3,SJ,SC8,SK,SPC3,SJ,SC8,
  SK,SPC,SB]":PRINT"[UP]";:NEXT
11130 PRINT"[SJ,SC5]PRESS[SC]A[SC]KEY[SC]TO[SC]START[SC]
  THE[SC]GAME[SC4,SK]";
11150 POKE V+2,60:POKE V+3,117:POKE 2042,147
11160 IF S>1 THEN POKE V+4,160:POKE V+5,117
11170 IF S>2 THEN POKE V+6,255:POKE V+7,117
11180 IF S>3 THEN POKE V+8,60:POKE V+9,180
11200 IF S>4 THEN POKE V+10,160:POKE V+11,180
11210 IF S>5 THEN POKE V+12,255:POKE V+13,180
11300 GET A$:IF A$=""THEN 11300
```

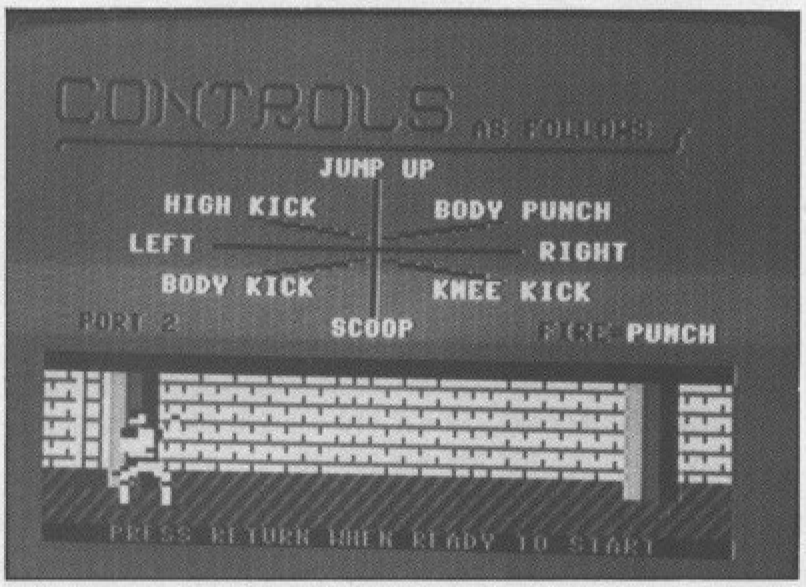



```
11302 FOR N=0 TO 15:POKE V+N,0:NEXT
11305 PRINT"[CLEAR,BLACK,DOWN6]":POKE 53281,4:POKE 53280,4
11307 PRINT"[SPC4,SI2,SPC,SU2,SC,SI,SU,CR,SI,SU,SC,SI2,SPC,
  SU2,SC,SI,SU,CR,SI2,SU,SC,SI2,SPC,SU2,SC,SI]"
11309 PRINT"[SPC4,SB2,SM,SB,SJ,SC,SI,SPC,SB,SPC,CQ,SC,SK,
  SB,SPC,SB2,SPC3,SB,SPC,SB2,SPC,SB2,SM,SB,SJ,SC,SI]"
11310 PRINT"[SPC4,SK2,SPC,SJ2,SC,SK,SPC,SK,SPC,SK,SJ,SK,SJ,
  SC,SK,SJ,SC,SK,SPC,SK,SPC,SK,SJ,SC,SK2,SPC,SJ2,SC,SK,
  DOWN5]"
11320 PRINT"[SPC8,SU,SPC2,SI,SPC,SU,SPC3,SU,SC,SI,SU,SC,SI,
  SPC3,SI,SPC,SU,SPC2,SI]"
11322 PRINT"[SPC8,SB,SPC2,SJ,CR,SK,SPC3,SB,SPC,SB,CQ,SC,SK,
  SPC3,SB,SM,SB,SPC2,SB]"
11324 PRINT"[SPC8,SJ,SPC3,SK,SPC4,SJ,SC,SK2,SJ,SK,SPC3,SK,
  SPC,SJ,SPC2,SK]"
11326 GET A$:IF A$=""THEN 11326
11330 IF A$="N"THEN GOSUB 1600:GOTO 500
11347 GOSUB 11800
11348 PRINT"[CLEAR,BLACK,SU,SC,SI,SU,SC,SI2,SPC,SU2,CR,SI,
  SU,SC,SI,SU,SC,SI2,SPC2,SU,SC,SI]"
11349 PRINT"[SB,SPC2,SB,SPC,SB2,SM,SB,SPC,SB,SPC,CQ,SC,SK,
  SB,SPC,SB2,SPC2,SJ,SC,SI]"
11350 PRINT"[SJ,SC,SK,SJ,SC,SK2,SPC,SJ,SPC,SK,SPC,SK,SJ,SK,
  SJ,SC,SK,SJ,SC,SK,SJ,SC,SK,SPC]AS FOLLOWS[SPC,SU]"
11360 PRINT"[SU,SC35,SK]"
11370 PRINT"[SPC16,YELLOW]JUMP UP
11380 PRINT"[SPC19,BLACK,SB]
11390 PRINT"[SPC7,YELLOW]HIGH KICK[SPC3,BLACK,SB,SPC3,
  YELLOW]BODY PUNCH"
11400 PRINT"[SPC12,BLACK,CT,SE,SD,SC,SF,SR]π[SB]π[SR,SF,SC,
  SD,SE,CT]
11410 PRINT"[SPC5,YELLOW]LEFT[SPC,BLACK,SC9,S+,SC8,YELLOW,
  SPC]RIGHT"
11420 PRINT"[SPC12,BLACK]π[SR,SF,SC,SD,SE,CT,SB,CT,SE,SD,
  SC,SF,SR]π
11430 PRINT"[SPC7,YELLOW]BODY KICK[SPC3,BLACK,SB,SPC3,
  YELLOW]KNEE KICK"
11450 PRINT"[SPC19,BLACK,SB]
11460 PRINT"[SPC2,BLACK]PORT 2[SPC9,YELLOW]SCOOP[SPC7,
  BLACK]FIRE=[YELLOW]PUNCH[DOWN2]"
11470 GOSUB 10220
11480 PRINT"[DOWN7,BLACK,RIGHT3,RVSON,SPC]
  PRESS RETURN WHEN READY TO START ";:J=0
11490 GET A$:GOSUB 600:GOSUB 830
11500 IF A$<>CHR$(13)THEN 11490
11550 GOSUB 1600:J=1
11590 GOTO 500
11595 REM** MOVE ***
11600 POKE I2,0:POKE I2,129:POKE A2,8:POKE H2,8:POKE L2,8
  :RETURN
11610 POKE I3,0:POKE I3,129:POKE A3,8:POKE H3,80:POKE L3,80
  :RETURN
11620 POKE I2,0:POKE I2,129:POKE A2,7:POKE H2,200
  :POKE L2,255
11630 POKE I3,0:POKE I3,129:POKE A3,6:POKE H3,200
  :POKE L3,255:RETURN
11695 REM**YOU DID IT**
11700 FOR N=0 TO 15:POKE V+N,0:NEXT
11710 PRINT"[CLEAR,DOWN8,BLACK]":POKE 53281,2:POKE 53280,2
11720 PRINT"[SPC6,SI,SPC,SU2,SC,SI2,SPC,SU,SPC2,SU,CR,SC,
  SI2,SU,CR,SC,SI,SPC2,SI,SU,CR,SC,SI]"
11730 PRINT"[SPC6,SJ,CR,SK,SB,SPC,SB2,SPC,SB,SPC3,SB,SPC,
  SB2,SPC,SB,SPC,SB,SPC2,SB,SPC,SB]"
11740 PRINT"[SPC7,SK,SPC,SJ,SC,SK,SJ,SC,SK,SPC2,SJ,CE,SC,
  SK,SJ2,CE,SC,SK,SPC2,SK,SPC,SK]"
11770 FOR N=1 TO 1000:NEXT
11790 GOTO 11000
11795 REM**INSTRUCTIONS**
11800 PRINT"[CLEAR]"CHR$(14):POKE 53281,2:POKE 53280,2
11810 PRINT"[BLACK,SPC2,ST,SH,SE,SPC,SK,SU,SN,SG,SPC,SF,SU,
  SPC,SM,SA,SS,ST,SE,SR,SS,SPC]BY[SPC,SW]ILLIAM[SPC,SF]
  ONG[DOWN]"
11820 PRINT"[SS]INCE THE BEGINNING OF THE[SPC2]CIVIL[SPC2]
  WARS"
11830 PRINT"IN[SPC,SC]HINA MANY OF THE[SPC,SM]ASTERS HAVE
  [SPC2]DIED"
11840 PRINT"IN BATTLE.[SPC2,ST]HIS LEAD TO THE FORMING OF"
11950 PRINT"LEARN OF THE HIDING PLACE OF THE STRONG"
11960 PRINT"HOLD OF THE MAIN EVIL GROUP.[SPC,ST]HE[SPC,SE]
  MPIRE"
11970 PRINT"HAS GIVEN YOU GOLD TO DESTORY THEM."
11980 PRINT"[SY]OUR TASK NOW BEGINS![SPC2,SW]
  ILL YOU RETURN?"
11990 PRINT"[SC]AN YOU DESTORY THE LEADERS OF THE THIS"
12000 PRINT"EVIL REVOLUTION?[SPC2,SO]NLY YOU CAN[SPC2]
  DECIDE.[DOWN2]"
12010 PRINT"[YELLOW,SPC8,SP]RESS A KEY TO CONTINUE"
12020 GET A$:IF A$=""THEN 12020
12030 PRINT"[CLEAR]"CHR$(142):RETURN
```

KUNG FU MASTERS2

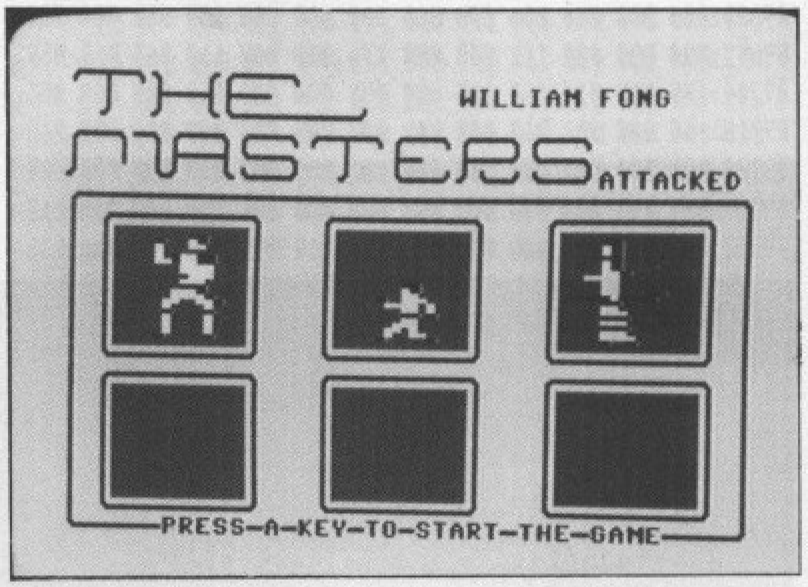
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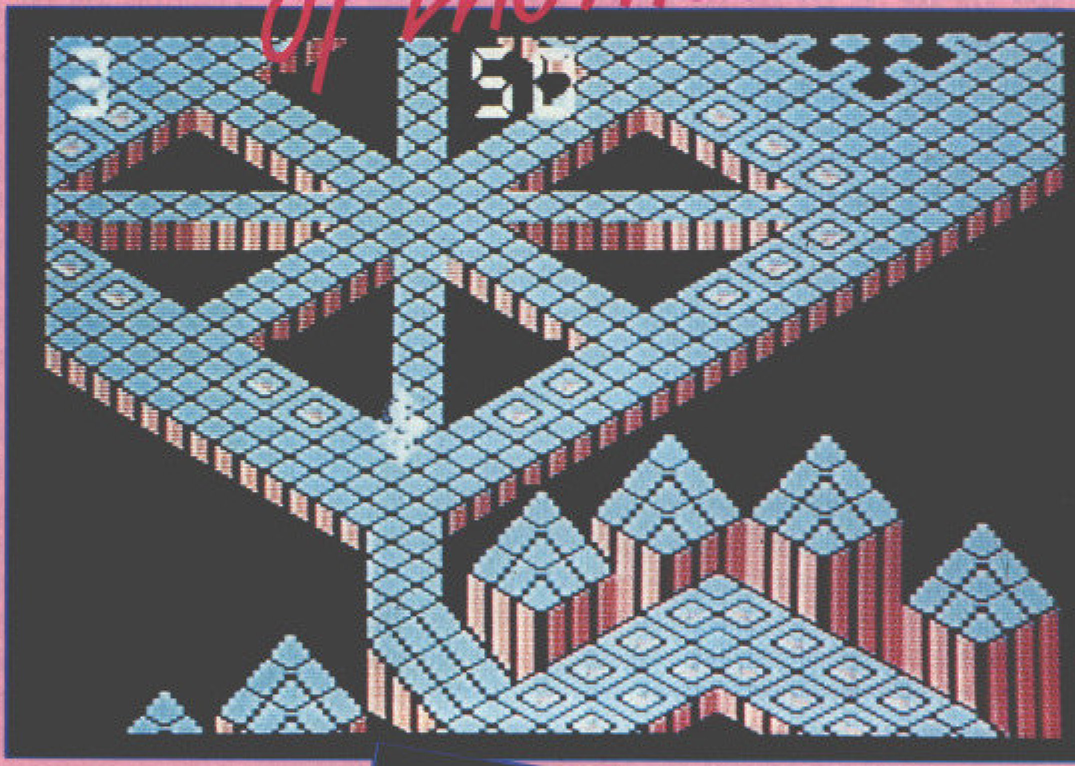



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GAME of the month

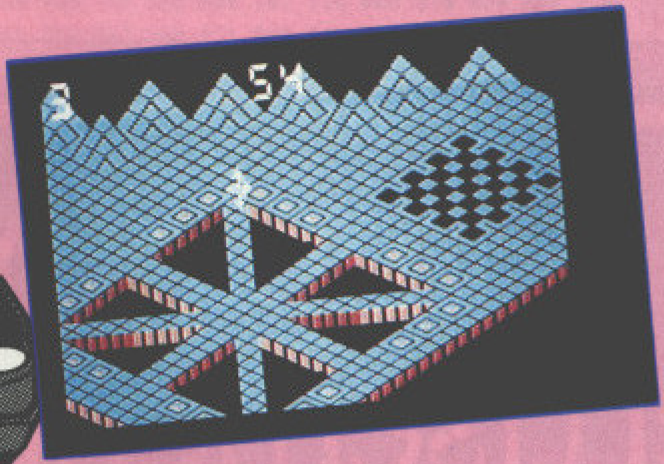
Melbourne House's Gyroscope really gets the adrenalin flowing. Eric Doyle recovered sufficiently to write a review.

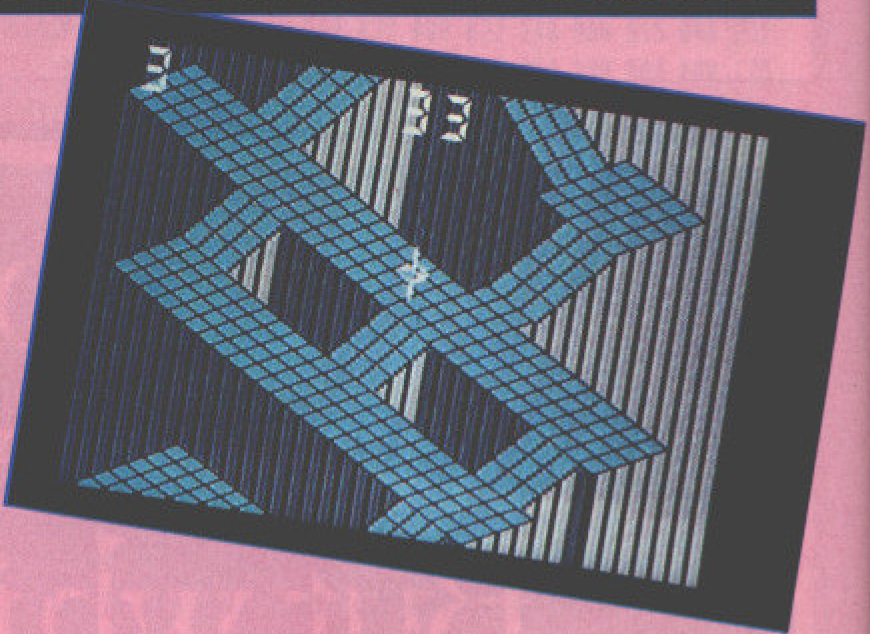


AS AN ARDENT ARCADE GAME FREAK, I often wish that my latest favourite was available for my home micro thereby saving me hundreds of pounds feeding up the machine for just one more go. Marble Madness was one such addiction in which you had to steer a marble around a treacherous course whilst being attacked on all sides by colliding objects and your opponent's marble in a race for the finish line. Now I have Gyroscope which was obviously developed by someone with a similar passion to mine but, in this case, it is a one player game.

The action takes place on a geometric landscape which has pitfalls galore. The surfaces are divided up into squares giving a 3D appearance with hills and hollows to impede your progress. Your task is to guide the gyroscope around each section and into a hole at the end of the course which leads to the next screen. Sounds like a piece of cake, doesn't it? Well it did to me but that delusion was







soon dispelled.

Crossing the landscape within the time limit and controlling the wretched gyroscope is the main preoccupation throughout the game. The gyroscope seems to have a mind of its own and wanders about paying little heed to your frantic joystick manipulations. At least, that's how it seems!

The landscapes all slope downwards in ramps and terraces which vary in width and at the edge of each surface is a fatal drop which seems to attract the gyroscope like a cliff attracts a pack of lemmings, with similar tragic results.

As though this natural attraction was not enough, the fiendish programmer has devised a series of magnetic panels which 'throw' the gyroscope in the direction of an arrow printed on the panel's surface and invariably pointing to the nearest chasm. Negotiating a path through a field of these little devices is rather like walking through a minefield in lead diving boots; just say a prayer, shut your eyes and go for it. With luck and a little quick witted thinking, you'll make it.

Paradnoia is not a natural attribute of mine but I'm sure the little aliens which wander about the landscape have got it in for me. They seem to lurk in wait, knowing that they are guarding the only possible route I can take. I'm sure I can hear them cackling in anticipation of the havoc they are going to reek when my gyroscope comes within striking distance.

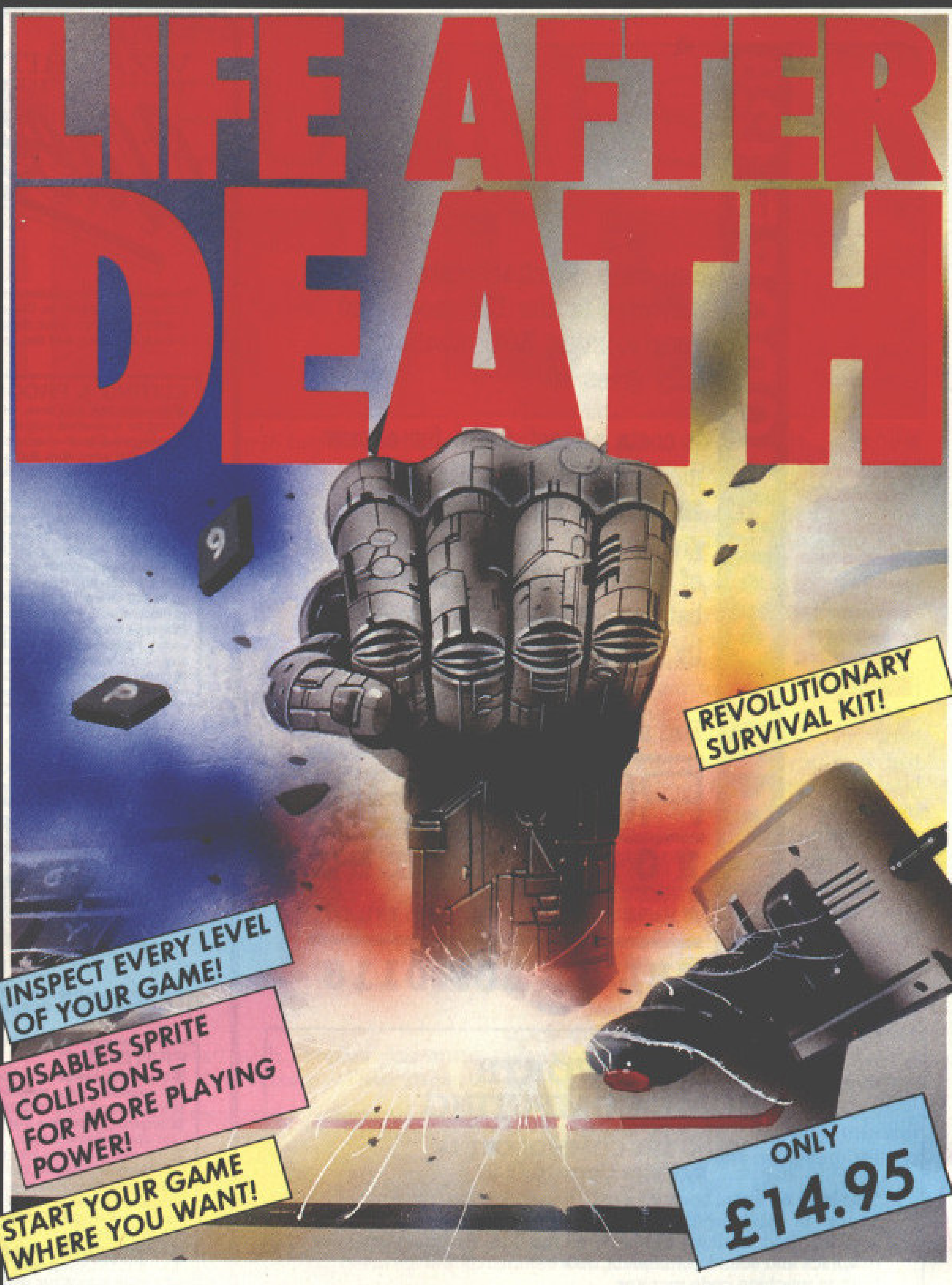
Slippery glass panels mean that your gyroscope will slide about and accelerate down slopes and only by pulling the joystick in the opposite direction will you prevent disaster.

Although the rules state that seven lives are awarded, and this is indeed true in versions for other machines, my C64 game only gives five lives and the first version would not allow me to progress beyond the third level. Melbourne House assures me that this was caused by a faulty master tape and that all the versions currently on sale are bug free. I must congratulate Melbourne House on this prompt reaction to my complaint and I am assured that anyone who may have acquired a rogue copy which may have slipped through the net will be treated with the same alacrity.

The game is worth every penny and with 30 screens to cope with it will be a long time before anyone discovers the surprise at the end of the game.

Panic will be your worst enemy but if you can keep your head when all about are losing theirs, you'll be a man, my son.

GAME KILLER



Here's the amazing **GAMEKILLER!** The cartridge that lets you zap your way through all the sprite collisions – right to the very end of your game.

Gamekiller is a revolutionary kind of survival kit. Just what you need to play today's complicated games – giving you the best chance of playing sprite collisions without losing a life.

Now you can actually see what happens at every stage of the game – and you'll find out if your game really has all the screens it claims to have!

With Gamekiller, you live to play the game through to the finish!

WARNING: It is possible that some of the games you own will not have all the levels and screens promised by the software houses. This could mean that you could send them back due to false information under the Trade Descriptions Act.

The **Robtek** Gamekiller is available from all good computer dealers.

Enquiries to **Robtek** (*formerly known as Robcom*) Ltd., 36 Market Place, Falloden Way, London NW11 6JP. Telephone: 01-209 0118.

Patent and copyright applied for

ROBTEK

COMMODORE 64/128K

OTHER FORMATS AVAILABLE SOON!

BUSINESS FILE

Dave Crisp looks at Micro-Simplex, a computerised cashbook for small businesses.

Micro-Simplex

ALL TYPES OF BUSINESSES NEED TO KEEP accounts. Ask any person running a small business what they dread most and the answer more often than not is book-keeping and VAT.

In a business where most takings are cash and accounts are kept weekly it is quite common to find people using the Simplex D Cashbook system.

This is a manual cashbook and one that seems to have been around since time immemorial. I used it when I first started in business and very successful it was too.

First Steps to Computers

Many small business men have their first taste of a computer when they transfer from manual simplex to Micro-Simplex. Micro-Simplex is the computerised version of the cashbook and as such it is possibly the easiest one to use. In essence it does the same ljob as the simplex cashbook but there are many more features.

The manual presumes you have no knowledge of either computers or accounting and starts from square one. It even tells you how to plug everything in.

The manual guides you in a clear logical way presenting procedures as they appear in the program. Screen dumps are found on pages where this clarifies the text and so it is possible and indeed recommended to go through the manual once or twice without using the computer.

Hardware

The program itself is in a multipart format and so between major menu-choices it is usual to hear the disc start running and loading that particular option. This does not take much time and is not as bad as it sounds.

Because so much information is stored it is required that you have a separate data-disc. This means that at certain times there is a considerable amount of disk swopping which after a few weeks use does get rather irritating. The answer to this is a second disc drive which makes using the program so easy it is hard to describe.

The cost of a second drive seems off-putting but do not forget if you are in a position to use Simplex then the cost of that second drive can be offset against tax.

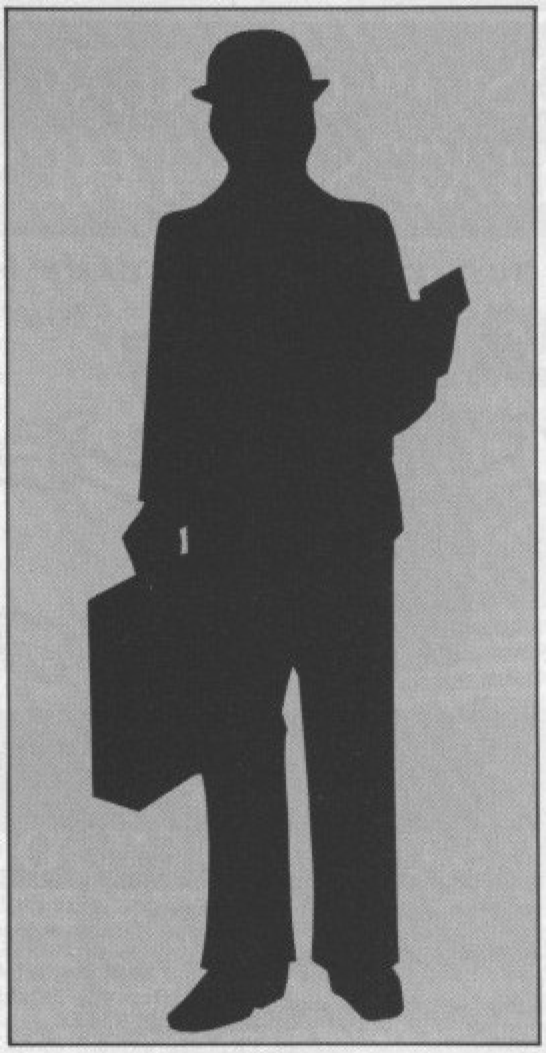
Simplex is set up in such a way that you can upgrade from a single to twin drives mid-year without having to re-configure the system. Most of Simplex is written like this is a second disk drive which makes gone into making the program easy to use.

Support

When you buy Simplex you need to register as a user. This is free but I can recommend spending another £25 and becoming a member of the Simplex Users Club. This membership entitles you to a free updating service as well as keeping you in touch with other users via a newsheet which also contains hints and tips. Membership also allows you to use the Hotline which is a godsend if you suffer any problems.

Setting Up

Before you start with Simplex you must 'configure' the system. This means



entering company details, opening balances, screen colours, type of printer being used and so on. Once done you can forget about it. Then you need to tell it a little about how you want to keep your accounts.

To do this you must set up departments for payments and receipts.

Lets take the example of a grocer as they do in the manual.

You may want to split up receipts in several headings. e.g. general takings, alcoholic drinks, cig/tobacco, and newspapers and so on or you may just want one heading; for example, general takings. This is entirely up to you when you set up. The advantage of full analysis is that it gives you far more sales information.

With regard to expenses, the same system is used. You can split your expenses into departments as above or have one heading for all your stock.

For payments on items other than stock there are spaces to add your own plus the usual ones set up already such as heat and light, rent, rates, telephone, advertising etc.

All these headings have a number which you use when entering either receipts or payments.

When making a payment for business stock this is the information you will need to enter.

1 Payment number (used only to amend mistakes)
2 Analysis code. Enter the category number e.g. 04 for cig/alcohol
3 Date/cheque number
4 To whom paid
5 Amount
6 VAT Content (if applicable)

The format is roughly similar for other payments/receipts and takes only minutes to get the hang of.

Bank Routines

There are routines for managing payments and withdrawals from the bank as well as entering standing orders and service charges etc.

Unpaid bills

When you receive a bill it is possible to enter it as an unpaid bill. Then when you come to pay it the information is there already. These need not be entered but I

find that it does help. Also there is the fact that at end year these unpaid bills are taken into consideration in the profit/loss sheet.

Foul-ups

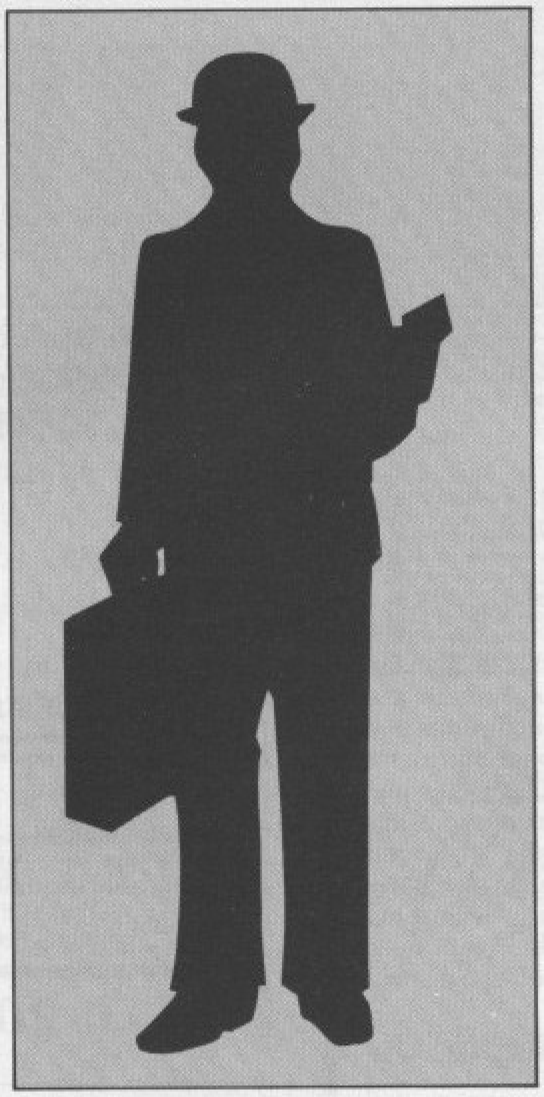
Everybody makes mistakes. One error in your accounts can be carried through the year if not picked up. Some accounting systems have little or no error correction whatever but simplex allows full error correction though it can seem a little complicated at first use. Persevere though and like most of simplex you will find you rarely have to refer to the manual.

Reports

Perhaps the most impressive thing about Simplex is the volume of reports it can print out.

It seems that you do not enter half the information it can print out but so much of the work is done 'underneath' Simplex.

There are reports for receipts, departmental analysis, payments made to the bank, payments made for business stock, payments for other goods, weekly bank reports, weekly cash reports, other receipts, cheque reconcilliation lists, audit trails and profit and loss accounts.



VAT

VAT is often a nightmare. With Simplex problems are almost non-existent. At the end of a VAT quarter it will print out the information you need to put on your VAT return. It really is as easy as that. I have seen Micro Simplex sold on this alone.

It will cope with VAT schemes A, B, C, D, E, F and pharmacy scheme B which covers most of the schemes in common use. If you use a scheme other than this I am afraid you will need a bigger Commodore.

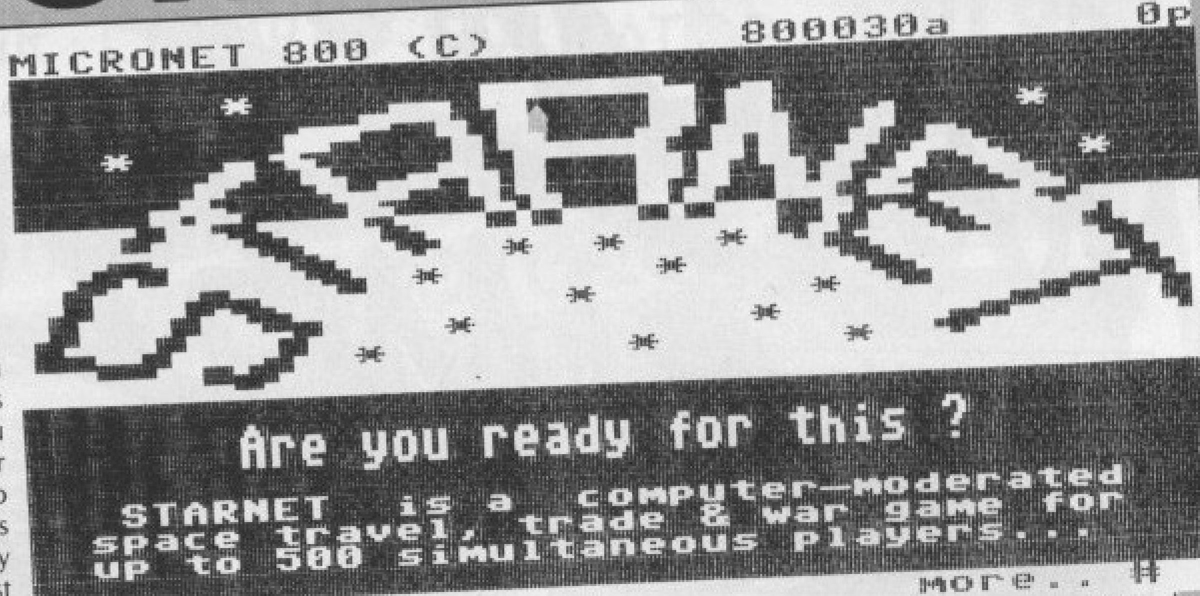
I have installed Micro-Simplex in many small businesses and there have been virtually no problems. Problems have only arisen where operator error has not been noticed but in these cases the problem has always been sorted out with no loss of data.

Improvements

Micro Simplex could be improved in one respect. There are many software based fast loaders available now and it would be nice if one of these could be incorporated into Simplex. Apart from that. . .no moans. It's satisfying that the only moan I can come up with is one which is actually a problem with the speed of the hardware rather than a problem with the software. Well done Simplex!

COMMUNICATION-

Link up with regular columnist David Janda and find out what's going on in the communications world.



WELL, WE'RE INTO THE THIRD MONTH of the new year. No doubt many of you will have been given a modem at Xmas and have been having a good time! If you haven't subscribed to Micronet or Compunet yet, then now is the time to give it some serious thought. Both systems intend to introduce new features early this year and we can now expect at least one other major commercial database to start up real soon.

Micronet Bits

The big news at the time of writing in December is that Starnet is now active. Some Netters may remember Starnet when it was run on an old Pet. Bug-ridden, the game had troubles from the start, but it has been completely rewritten on the Beeb (ugh!).

Starnet is a game in which you – a star captain – try to increase the size of your fleet and your control over the galaxy. Brain power in great quantity is required to plan each move which is made every other day. The game is very complex, and the instructions themselves cover many frames, but are essential reading. Although the game is not played in real time, you can join forces with fellow players to defeat others. You can even be a double crosser and biff your fellow star captain who thinks you are on his side.

To play Starnet you have to register as a captain which costs a hefty 99p. Select yourself a romantic space name, and you'll be informed of your start sector in a few days time via mailbox. Each move costs 25p and is done every other day. If you manage to overthrow the Throne ship, your moves will be free from then on. Starnet is at page 800030000 – good luck!

The Chatlines have also been tidied up (technical wise). It is now impossible for anyone to send those multiple messages, and the system will not permit you to buy the message frame if mailbox is down.

The last snippet of Net news is that up and coming Micronet mega-star Peter Probert has now been promoted to Publicity Manager (cor!).

Compunet Chatting

Compunet has now introduced Party-line, and not a moment too soon. To use Party-line you must first buy a link program which costs 10p. The link stays in your modem unless you buy another program or link, so you can go in and out of Party-line during a Compunet session without incurring the 10p charge each time. If you want to buy programs/links then do so first, then use Party-line.

Once in, the screen is split into two windows with a Duckshoot. The larger top part is used to display all the messages sent, and the bottom part is for entering your own messages and commands.

At the time of writing, Party-line costs £1 per hour with the first one min 48 secs free. This is so you can check to see if any-one is on. After that it costs 1p for each 36 seconds on.

Up to eight users can use Party-line at any one time. According to Compunet, this restriction is for practical purposes rather than technical. The idea being that if you have more than eight users at once, things get confusing. No doubt Compunet will be introducing more Party-lines as time goes on. Price wise, myself and quite a few people on CNET think it's too much.

Both Party-line and the more regular Chat online are to be found on directory 1000.

Have you ever wished you could get a directory when you are online? Well if you are online and need a disk directory then pop along to 242 where you can link an online DOS program which is free. It's very useful in an emergency, but for long term usage why not download the Compunet boot program and DOS 5.1 which are also free at 126.

News

By the time you read this, Modem House should have released its Voyager 7 modem. The modem operates at 300/300, 1200/75, 75/1200 and has everything!

When asked about approval, Keith Rose, Modem House mega-boss said; "Of course it's approved. The Voyager has also been approved by the Galatic Federation of Telecom for use anywhere within the Milky Way."

On a more serious note, it's clear to see that Modem House and Miracle Technology (with its Multimodem) are in fierce competition. The market is becoming saturated with modems for all micros, and I predict that quite a few manufacturers are going to go bust before summer. I wonder who?

Wanna chat with me? Then drop me a line on Prestel 919992677 or Compunet ID D. JANDA.



CORNER

missives missives missiv

Dissatisfied? Unhappy about something? Pleased with the way Your Commodore caters for your needs? Write and tell us about it.

Tape Trouble

SINCE YOUR COMMODORE TOOK over Your 64, there is one most useful feature which was available and now seems to have fallen by the wayside. Messrs Digitape provided a service which could supply a tape containing all of the programs from a particular issue.

Your magazine certainly contains far more useful utilities, but for those with limited time at their disposal a similar service would be most helpful.

Trusting that you will consider this a constructive suggestion since a copy of Steve's Disk Editor would make an excellent start.

K F Whittaker, Maidenhead

Thank you for your kind comments regarding the contents of the magazine, we do try to publish useful programs and maintain a very high standard of listing. However, we do realise that some of the programs are extremely long, and very difficult to type in. You, and no doubt many other readers, will be pleased to know that this issue of the magazine sees the start of the Your Commodore Software Service. Each month we will be making most programs available on cassette. We will not be offering a disk as none of the programs will be protected so that you can easily back them up yourselves.

This month we are not only offering a cassette of most of the software in this issue but we are also making available a Best of Your Commodore cassette which contains some of the best programs published from the last year, one of which is the disk editor that you mention.

Scratch'n'Save

I was very pleased to see the Disk Editor which you published in the January issue of the magazine, I have been looking out for one for quite a while.

I have figured out how I can change specific areas on a disk but I am still a little unsure as to how the disc works. I have also been told that you can recover a file that has been scratched by using a disk editor. Is this so? If it is then could you please explain how you go about it.

G Higginbottom, Bognor Regis

Steve's Disk Editor has certainly sparked up a lot of interest. We are a little limited for space on the letters page to give you a reply to your question here. Elsewhere in this issue you will find an article that explains just how a disk is made up and gives you some hints about changing the content. You can rescue a scratched file from your disk as long as you haven't SAVEd anything else to it after the scratch command, the procedure for rescueing a file is explained in the article.

C-16 Plea

I feverishly flicked through the January 1986 edition to read the Mastering the C-16 article only to find that it wasn't featured!

The whole of the magazine was confined to the C64 (yet again!). I have been subscribing to this magazine since it first started in '84, because it devoted its editorial to all the Commodore products, now I find that it is just for the 64. I can't remember the last time I saw a program for the Vic.

With the cheap sales of C-16s and Plus/4s currently on offer there must be a large number of these machines in use together with lots of owners who are still waiting to type in your programs. If there are no features on these machines how do you expect to get programs to publish?

Why don't you publish a games programming series like you did for the Vic 20. I'm sure it would be welcome. Or how about a listing of some of the pokes that you can use on your machine?

C64 owners certainly seem to have a good time. Do I need to upgrade after getting what I thought was a good computer.

Please remember us C-16 and Plus/4 owners in your magazine in future.

Unsatisfied Reader, St Leonards

There has been no plot to forget the owners of Commodore machines other than the C64. We do try to include programs for all of the Commodore machines every issue. Some months however, this just isn't possible. Take the January issue for example. Mastering the C-16 was due to be published but managed to get itself lost somewhere in one of the many processes that articles have to go through before publication. Don't despair however as the missing part will be found in this issue and Joe Nicolson has lots of ideas for the future.

We agree with you that there must be a lot of C-16 and Plus/4 owners out there. Not a day goes by without some query regarding these excellent little machines. But material for these machines is a little thin on the ground and very difficult to find. Surely some of you C-16 and Plus/4 owners have produced some software that you would like to share with other people or perhaps you may have discovered some interesting things about your machine. If you have then please send them in as we are on the look out for material all the time and depend on you, the reader, for quite a lot of material published in the magazine.

So how about it, all you C-16 and Plus/4 owners, why not get in touch?

As for the poor Vic, even less material is around for this little beastie. No one can remember the last time that we received any material for this machine. So come on Vic owners why don't you get in touch as well? Surely not all Vics are sat gathering dust in cupboards.

The Goonies
US Gold

Originality 7 · Playability 10 · Graphics 7 · Value For Money 8



HAVING DISCOVERED AN old treasure map, a group of kids calling themselves The Goonies set off to find the loot that will financially save their town from some greedy land development company. It is your job to get Mikey, Brad, Chunk, Andy, Mouth, Data and Stef to the treasure through eight screens of bats, skulls, deadly slime, crushing rocks and an octopus. For each screen there are two Goonies and you must use them both to overcome the problems on the screen and enter the next stage.

The immediate problems facing the Goonies on the screen are not the only ones because they are chased by the mad Italian family the Fratellis. Mrs Fratelli is the leader but after seeing her, I somehow feel she would be better leading an Olympic shotput team!

The first screen begins in an old derelict building which has three floors. Here you must find the exit to the basement and get each Goonie out. The hazards are that Mrs Fratelli continally runs along the bottom level and any contact with her is fatal. At first the task of getting both characters out may seem difficult but with the aid of the money printer, Mrs Fratelli can soon be avoided.

Having found the exit the next two of the intrepid explorers are placed in an underground cavern. The secret here is to find the key and open the door at the bottom. However the route to the key is littered with traps. Huge boulders try to crush you to death and electricity cables try to kill you while you cross a deep pool of water. As well as all this, a rather unfriendly bat flaps wildly across the screen and contact with him results in immediate death.

The next six screens become increasingly difficult and have some bizarre problems to overcome. The third stage is very tricky and takes quite some time to master. The task is to burst a large pipe but avoid being blasted by jets of steam which are frequent. The use of the two characters is very important here if you are to succeed and an added hazard – one of the Fratelli brothers – is equipped with a gun so dodging bullets is another thing to keep in mind.

Screens four and five feature ladders and platforms whilst the sixth has some deadly slime to deal with. Having seen the film two months ago, I recognised all the previous screens which gave me a slight advantage. The seventh stage however posed a problem – on the shape of a large octopus. When I saw the film the octopus scene was cut out, and with only two men left I didn't know what to do. Somehow, with extreme luck, I managed to complete the screen and entered the final stage, where the loveable, but very definitely dead pirate, One Eyed Willie and the treasure were situated. Getting the treasure was just reward for the effort I had put in to conquer the previous screens.

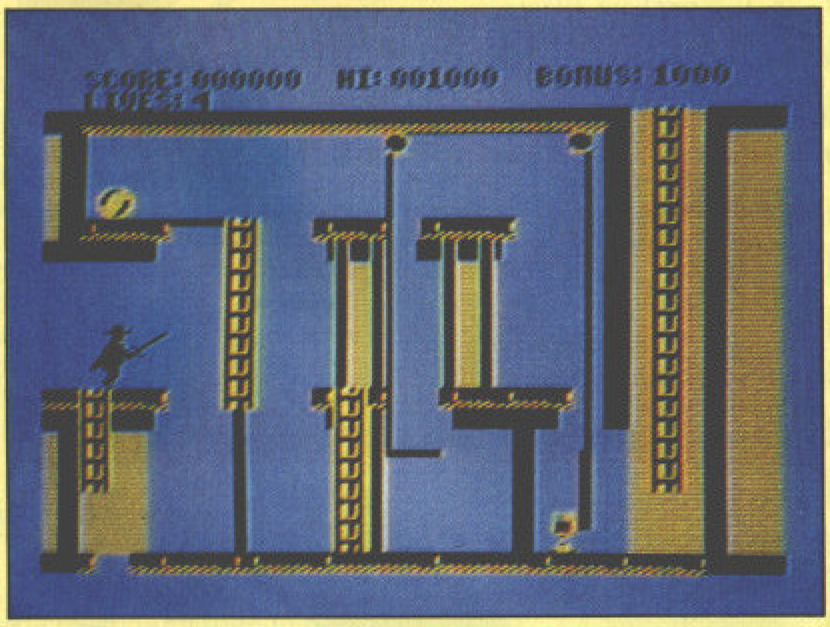
The game has an outstanding feature in playability. The essential changing of characters is done simply by pressing the fire button which allows the game to continue quickly. The degree of difficulty is very good compared to games like Pitfalll II etc. and this is certainly an appealing factor. Some nice music makes the games as a whole entertaining but sadly the graphics are not up to the standard I have come to expect from US Gold. The sets in the film are excellent but the reproduction in the game is well below par. One advantage the game boasts over the film, is the fact that the characters thankfully do not speak!

No doubt the success of the film will make this a hit this year.

S.K.

Zorro
US Gold

Originality 7 · Playability 6 · Graphics 5 · Value For Money 6



WITH THREE LIGHTENING fast slashes of his rapier in the shape of a 'Z', Zorro carves up yet another opponent. A quick leap onto the sofa and he bounces up to the walkway on the other side of the room out of harm's way, at least for the time being.

Zorro is an arcade adventure based on the masked hero of the old films and TV series. Here, he is trying to rescue a beautiful senorita from the clutches of the evil Sergeant Garcia. Before you can reach her though, you will have several problems to solve and objects to find to help you on your quest. Naturally, you aren't told what these are and you may find things a little confusing at first.

Zorro's two trademarks are his marvelloys swordplay and his mighty leaping over the rooftops, swinging from the chandeliers etc. and the game features both these attributes prominently. The swordplay with the guards is just designed to slow you down and reduce your bonus score but it is easy to get too careless and lose one of your lives. Leaping around requires very careful positioning and you will usually have to bounce several times on an object to gain enough height to jump up to where you want to go. See-saws, trampolines, curtain rails and large rubber balls all appear.

The graphics are quite disappointing, not very clear and in uninspiring shades of brown and yellow. The effect is of some interesting ideas and problems to be solved but not particularly well implemented.

G.R.H.

Fight Night
US Gold

Originality 6 · Playability 9 · Graphics 8 · Value For Money 8



BOXING GAMES ARE ALL THE rage at the moment and US Gold's contender Fight Night must have a very good chance of becoming champ. Apart from the actual bouts themselves, you have the opportunity to design your own potential Muhammed Ali, train him and let him spar with other boxers before letting him loose in the ring.

Construction involves selecting a head, body and legs from thos given. You can name your character and change the colour of his skin and trunks etc. You then assign values to your boxer's strength in head and body punches and also what punishment he can take.

Then it's off to the gym for a spot of practice. There are eight moves to be mastered – two punches, two feints, guard up and down and move left and right. The computer leads you through a series of training routines.

In the ring, you have three three-minute rounds to win either on points or by a knockout. The graphics and animation are excellent. You start against the number four contender, Dip Stick. He is a dirty fighter and his favourite punch is a decidedly low one to your nether regions which brings tears to your eyes and makes your man go cross-eyed and weak-kneed. If you win, you have three more bouts to get through before you're allowed a crack at the champ.

Fight Night is the best boxing game that I have yet come across, appealing to people who both love and loathe the real thing. **G.R.H.**

Starion
Melbourne House

Originality 7 · Playability 8 · Graphics 8 · Value For Money 8



AT LAST, A SHOOT-EM-UP with some original features. As Starion from the Space Academy, you must fly backwards in time trying to repair the damage in the space-time continuum, deliberately destroyed by aliens who are your technological superiors.

You find yourself in a time grid containing nine different zones. Selecting a zone, you must destroy a specified number of enemy ships. These are superbly depicted in 3-D vector graphics. Every time you shoot one, you can pick up the alien's cargo which is in the form of a letter. When you have destroyed the entire enemy fleet, the letters you have collected need to be unscrambled in order to give you the nature of the cargo. However, solving the anagram is only half the problem. After flying through a time warp, you must decide in which time zone the cargo belongs. If you choose correctly and visit the appropriate planet, all well and good. If not, you must battle away to another warp and try again. When you complete one grid, you are let loose on another eight. It's tough being hero.

Control of the ship is fairly simple. You can bank, dive, climb and adjust your velocity. Your instrument panel has two radar screens giving the location of the enemy as well as indicators showing the number of ships to be destroyed plus fuel, oxygen and temperature levels.

Starion is a highly original space game. Well worth a look.

Falklands 82
PSS

Originality 7 · Playability 8 · Graphics 6 · Value For Money 7



HAVING BEEN THE BUTT OF much adverse publicity over previous titles – Theatre Europe – PSS seems likely to attract similar attention with this latest game which is a wargame simulating the British attempt to regain the Falkland Islands after the Argentinian Invasion.

You have between 25 and 30 turns to either occupy all 10 settlements or totally destroy the enemy forces. There are four potential landing sites and you can investigate the defences in two of these using the SAS and SBS. Those units are important as they are the only ones with the ability to reconnoitre the surrounding area.

All your troops are given four values, an aggression factor, defence factor, movement allowance and attack range. The first two numbers will change due to the effects of combat. After you land, you get options to move, attack (if in range) or do nothing. Combat may be at close quarters, over a distance for artillery barrages or you may summon up an air attack or naval bombardment.

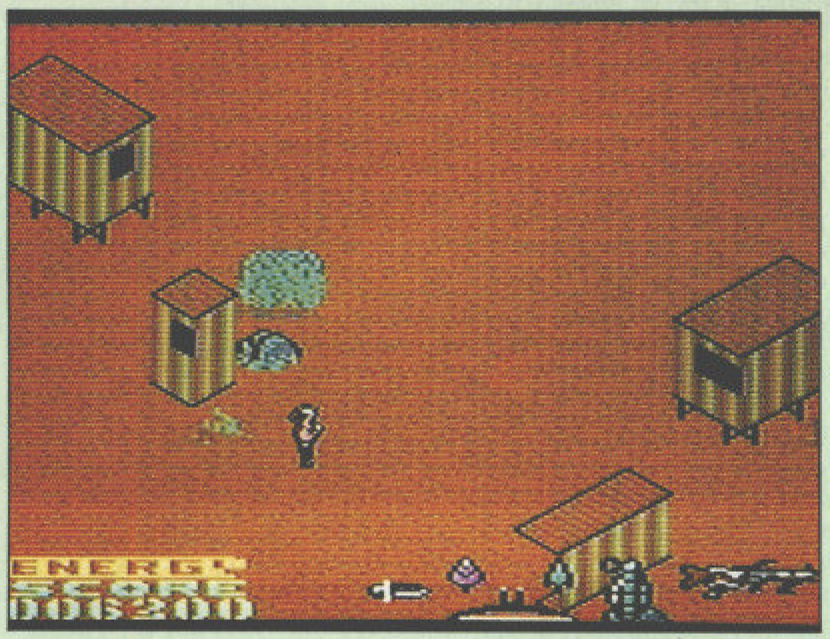
Movement depends on your movement allowance and the type of terrain you are crossing. Your move might be cut short if there is an air attack and ends automatically if you move next to an enemy unit.

The graphics are simple and clear which is essential for good wargaming. There are five skill levels and the game plays very well.

G.R.H.

Rambo
Ocean

Originality 8 · Playability 9 · Graphics 8 · Value For Money 8



THE FILM RAMBO: FIRST Blood part II was a box office smash hit both in America and over here in England. If you have seen it, you will know that it is action all the way through with Rambo blowing up absolutely everything in sight in a desperate bid to rescue POWs against insurmountable odds and finishes off with a totally incomprehensible – but no doubt, very deep and meaningful – speech. Ocean has now written a game loosely based on the storyline of this film.

The actual game loads – preceded by a very good picture of Rambo with his rocket launcher – with absolutely incredible interrupt driven music pumping away in the background. When it's loaded, you enter your name and start.

Rambo is in the middle of the jungle. Your first task is to find the POW camp, cut free the prisoner tied to a bamboo cross in the camp and retreat to a helicopter positioned to the north of the camp. You have a knife and a cross bow (which may be loaded with normal or explosive tipped arrows) but a machine gun may be picked up on the way to the camp when you pass a secret temple. In order to reach the camp, you can either blast all the patrolling soldiers with your machine gun and blow your way through with your explosive tipped arrows or you can use a knife and sneak into the camp – the former method is more risky but gains more points. In either case, by the time you have freed the prisoner, the guards are running about with their machine guns blazing away. The best tactic here is to arm yourself with the explosive tipped arrows and blow your way through to the helicopter. One useful tip here is to keep firing. That way, any trees which could impede Rambo's progress are destroyed, together with any hostile soldiers.

Having successfully boarded the helicopter, you must then go back for the main body of prisoners. If you do manage to locate and free them without getting riddled with lead, a helicopter gunship is sent in pursuit. You have to destroy these fearsome machines – actually a MiL24 – and take the prisoners to the safety of Thailand. If you manage to do this, you go through the whole process again.

An energy band at the bottom of the screen shows Rambo's strength reserve and this gradually decreases as he is hit by enemy fire but it is replenished upon completion of each stage. As you would expect, the game ends if the energy drops to zero.

The most distinctive feature of this game is the quality of music and the variety of sound effects. They are incredibly atmospheric and actually increase the enjoyment of the game rather than irritate you as somtimes happens. I would go as far as to say that the quality of music (by Martin Galway, so I am reliably informed) is higher than that of the Monty Mole tune by Rob Hubbard. Not only that, the graphics are exceptionally good too. The way in which Rambo runs around with his muscles pulsating is quite a sight and it is very satisfying when several enemy soldiers turn into skeletons and disappear into the ground with a crunch as soon as they are hit by Rambo's machine gun fire. I also like the way in which the guards fell to the ground when their watch towers were blown up.

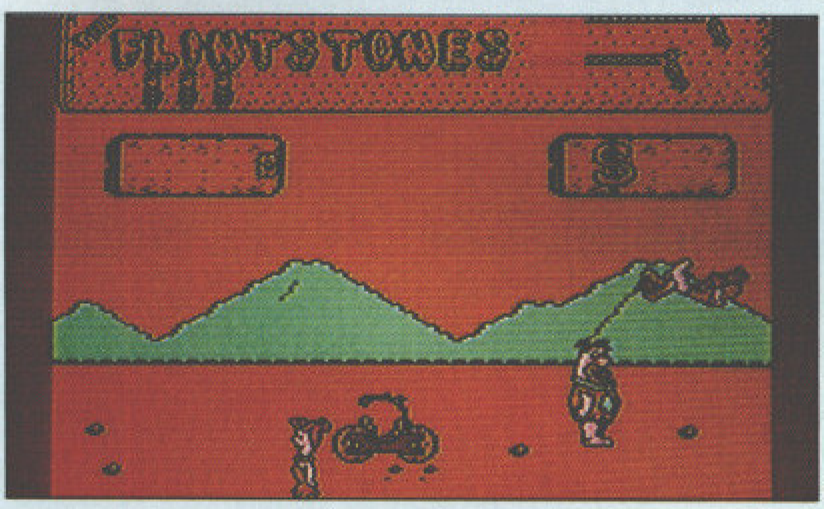
The game is not however, a glorified shoot-'em-up. There is an element of adventure involved in actually deciding how to go about rescueing the first prisoner, locating the main body of prisoners and finding your way to Thailand.

Although the hardened arcade addicts among you may find it a little easy to complete the mission, Rambo is a game which is technically brilliant and also remarkably exciting, challenging and very addictive. One interesting point however, is that you are instructed never to engage the enemy or to attempt a rescue in the instruction leaflet and the games intro. I wonder if anyone is going to take this advice?

S.S.

Yabba Dabba Doo
Quicksilva

Originality 7 · Playability 4 · Graphics 8 · Value For Money 5



FRED FLINTSTONE HAS fallen in love. The object of his desire is the delectable Wilma but she doesn't know it yet. Based on the children's cartoon series The Flintstones, Yabba Dabba Doo has Fred setting out to woo Wilma in true caveman fashion.

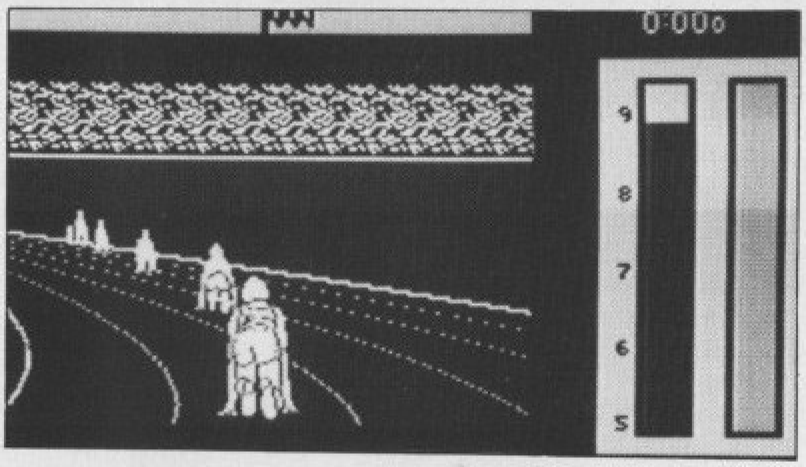
This he decides to do by building a house for the two of them to settle down in. Starting off with a pile of assorted stones, He must first clear the area of rubble before assembling his desirable residence. The rocks are of two types – flat ones that should be thrown into the pit and round ones which, when correctly placed, result in the appropriate bit of house appearing.

As Fred moves round collecting bits of rock, he must avoid collision with the assorted dinosaurs. Meeting with Wilma helps enormously, as does finding his car. He also needs to earn enough money to hire a dinosaur to help him put his roof up.

The main problem with this game lies in moving Fred from screen to screen. You can only reach higher and lower streets by moving diagonally at the edge of the screen. This tends to be a very hit or miss affair, and what is wrong with the normal method of leaving a screen top and bottom, left and right, I'll never know.

Yabba Dabba Doo is a very colourful game and looks most attractive but I think that it lacks lasting appeal and I ended up being more annoyed with it than entertained. **G.R.H.**

Run For Gold
Hill MacGibbon £7.95



SURELY EVERY ATHLETE'S ambition is to win a gold medal in the Olympic Games. Run for Gold, a sports simulation from Hill MacGibbon gives you a chance to try your luck in three events – the 400, 800 and 1500 metres. Unfortunately, when compared to other programs currently available, this one falls well short of the medal positions.

It is some considerable time before you get your medal. You start off in small local races and if you do well enough, you are invited to take part at Crystal Palace, then the European and World Championships before you reach the Olympics and of course, you have to improve constantly if you are to progress.

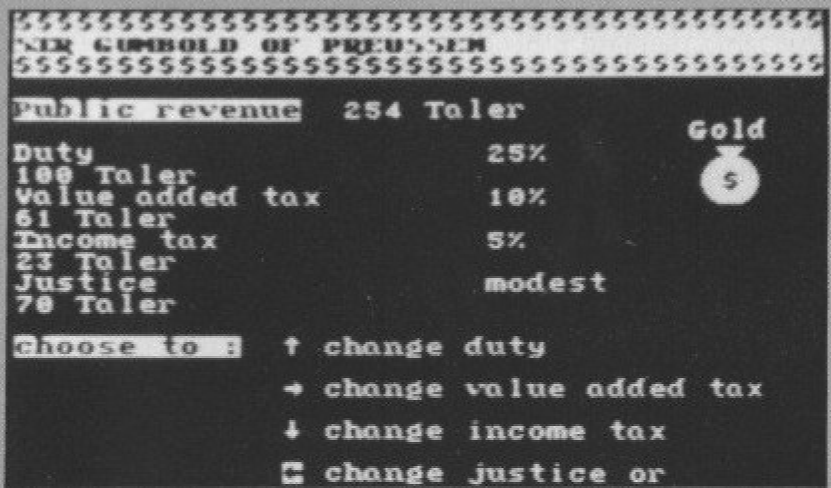
The main problem with the game is that you have very little to do. Apart from determining how fast your man runs throughout the race, the only other action you have is in changing lanes and only then if you select the hard difficulty level. There are two indicator bars, one for speed, the other for energy. The faster you go, so your energy decreases.

Graphically, the game presents a rear view of your runner, who is about half the height of the screen. All the runners are drawn in white and there are some problems when they overlap.

Playing the game feels very much as if you are taking part in the slow motion scenes in Chariots of Fire. If you are looking for sports simulations, there are many better ones around.

G.R.H.

Kaiser
Ariolasoft £9.95



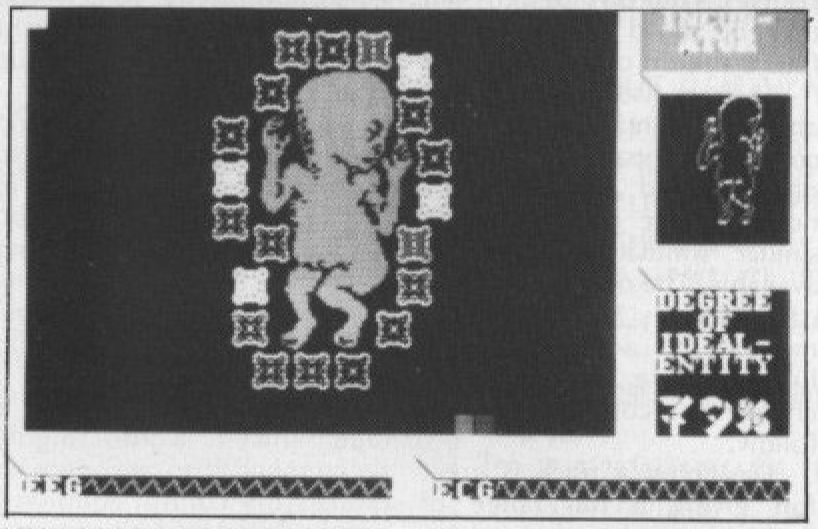
IT IS GERMANY IN 1700. YOU rule one of nine small provinces. If you display sufficient skills in administration, financial wheeling and dealing and military tactics, you may end up being crowned Kaiser.

Based on the game Kingdom, Kaiser is a menu-driven strategy game. Starting off with 10,000 Talers (the local currency), you begin by trading in corn and land. You must feed your people a certain amount but can donate extra food in the hope of attracting immigrants. Next, y ou are given the population statistics for that year – births, deaths etc. You must then set the budget for the following year by adjusting levels for assorted taxes. Then it's time to spend, as you decide whether to build markets, mills or develop your army. You can also wage war, but this comes later in the game. Bad administration results in your being suspended from office for a year.

Up to nine people can play, but be warned, with each turn taking a couple of minutes, you will not finish playing in an evening. Fortunately, it is easy to save the current position. Control of the game is entirely via the joystick and is easy to master. In order to win, you must have certain assets as well as five towns, a palace and a cathedral.

Kaiser is a similar game to APS's Evil Crown but is, in my opinion, considerably more playable. If you enjoy this sort of strategy game, Kaiser is well worth considering. **G.R.H.**

Deus Ex Machina
Electric Dreams



AT LAST SOMEONE IS EXPERIMENTING with new concepts in computer games. Deus Ex Machina is an intellectual effort, covering the development of a renegade from infancy to death through a Shakespearian ages of man approach in an Orwellian setting.

The package comprises two tapes, one containing the program and the other a musical and verbal accompaniment which is timed to run simultaneously with the game. The sound track boasts many famous names such as Jon Pertwee, Ian Dury, and Frankie Howerd performing original tracks which give cryptic clues towards the purpose of each section of the game.

Although the concept is sound and the audio tape is produced to a very high standard the games themselves are disappointing and a little facile. Many of them are just the same game recycled with minor changes. the ethereal, surrealistic qualities of the overall package will limit its appeal to the older age bracket who would probably appreciate more challenging games.

Deus is certainly unique but is liable to be hyped as being far better than it actually is because of its intellectual aims. A definite example of the emporor's new clothes.

A very laudable attempt at a new concept on a different level of consciousness but a little naive in its execution.

E.D.

Revs
Firebird £11.95



MOTOR RACING SIMULAtions have become more and more sophisticated and in complexity Revs is the best yet. Superbly packaged with maps of both the Brands Hatch and Silverstone circuits, a Formula 3 Driver's Handbook and Special Racing Programme no-one can complain about a lack of documentation.

A quick glance through the books leaves you in no doubt about the pedigree of this program with cars emblazoned with Acorn Computer stickers. Unfortunately this is unavoidable because the technical consultant is David Hunt who is sponsored by the said company.

Controlling the Revs car is an extremely complex business and the 24 page manual guides you step by step through the training programme which is equally applicable to the real world of motor racing as it is to the Revs world.

Control is exercised by keyboard keys and this is the one weakness of the simulator. An analogue joystick can be used but apart from my own Voltmace I know of very few computer journalists who possess one for the 64 let alone home users. A combination of paddle with keyboard or switched joystick can be used which is probably even less help unless you make your own paddle.

So it's keyboard then, and this involves seven keys for racing which it would have been nice to have as redefinable but this program makes few concessions.

Before commencing either a practice session or a race, the driver must set the angle of the wings which hold the car down on to the road. Both front and rear wings can be set independantly which gives plenty of scope for experimentation.

Starting the engine involves engaging the clutch, checking for neutral gear, pressing the starter andthen the rev counter can be increased to the required turn over speed. As you can see it is just like the real thing but there is one important difference; the engine is far more tolerant of misuse.

Steering and gear changes are fairly standard procedures using the rev counter as a guide (hence the name Revs). If you leave the track at any time the handling of the car changes accordingly. With grass under the wheels the car will slither about as though on an ice rink and skill is required to avoid a spin or stalling.

Wing mirrors are provided to give warning of approaching drivers who can be blocked from overtaking by a crafty bit of manoeuvring.

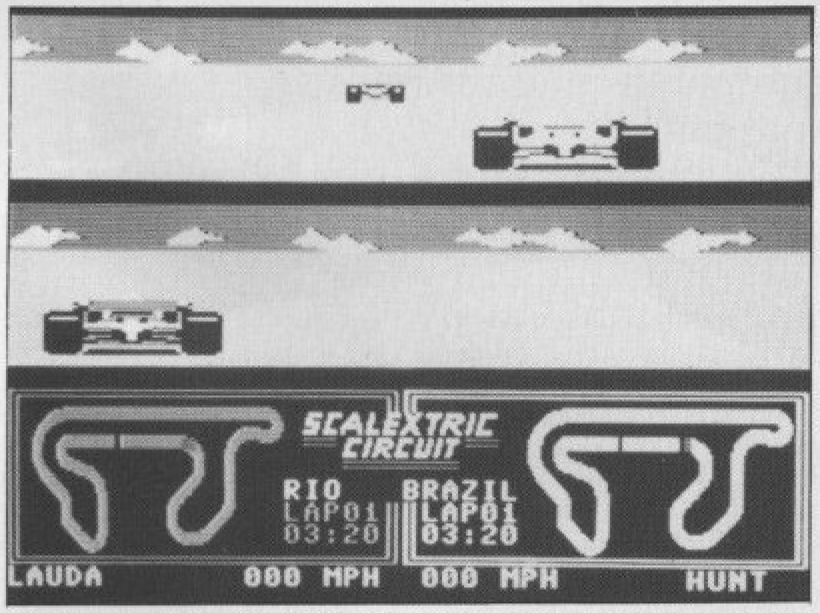
When the course can be negotiated within the 1.40 time limit you are ready for competition at one of the three levels depending on whether you make the qualifying time or not.

One really excellent facility is the pseudo multiplayer races. For example, two players can individually complete a qualifying round and then they take turns to compete in a race. During each race the role of the other driver is simulated based on the qualifying round and at the end a score card is displayed showing the statistics and results.

Graphically it is obviously a conversion from a BBC and I feel far more could have been done to the graphic display to make it more slick. Despite this and the fact that the sound effects are a little irritating I have got to say that this is the most realistic and difficult racing simulation which I have seen and one which I would heartily recommend though beginners may prefer to try something a little less demanding before moving on to this one.

E.D.

Scalextrix
Leisure Genius



WHEN I WAS A BOY MY Christmas and Birthday money was invariably spent on extensions to my ever growing Scalextric racing car track. Nowadays all this cash can be saved by investing in this game from Leisure Genius.

Basically it is merely a simple Formula 1 simulation but its advantage over the opposition is the ability to construct a track to your own design or to use one of the 17 preset tracks based on actual courses. Your own designs can then be saved and stored for future use on cassette or disk.

The race itself relies on your ability to manipulate and control the car's speed and direction and, as such, offers no advantage over the many similar simulations currently available. The only control you can exert is left and right movement, accelerate and brake. There are no gear changes or complex rules to follow.

Designing a track is great fun giving a full range of Scalextric track units such as banked curves, chicanes, four lengths of straight track and a selection of normal curves turning through various angles. After placing the starting grid where you want it, by moving a cursor around the screen, you can pick up a piece by cursor selection and start to build up your track.

The only problem I found with this is that if you want to make a change somewhere in the middle of the track you have to remove pieces working backwards from the starting grid, change the offending piece of track and then rebuild back to the grid.

Two players can enjoy a race and I would highly recommend it to anyone who dislikes the control complexities displayed by similar games.

E.D.

DATA MAKER

F Brun provides a handy routine to turn machine code into data statements.

WHEN USING MACHINE code, sprites, UDGs, hi res, or in fact anything that uses blocks of memory, it can be a bit of a pain to handle, as the Commodore has no built in machine code monitor as standard. So what!, you might say, I've got one here on cartridge/disk/tape. Ah yes, that's dead easy to use, and you could use a sprite designer to design the sprites, likewise a UDG designer for the characters. But, the major problem comes with compatability and clashing. It is highly probable that the sprite/UDG designer will sit in the same place in memory as your beloved program. Even the Your Commodore system for machine code files and data blocks can get a bit messy if you don't have – or can't use – the appropriate utilities.

The simple answer is to incorporate the data/mc as Basic Data statements. But, to do that properly you have to dump out the memory in hex to a printer (how many monitors allow you to dump decimal?), convert it to decimal, and then type it all back in again.

To do this accurately you have to be at least superhuman, even a Commodore User writer!, however there is an easier option.

With Data Maker, all you have to do is to save your data to disk, run the program, and then you will be left with a self standing Basic program with neat lines of data, each line having a checksum. This is so that if at any time you get the program a bit corrupted it will sort out the mess and tell you which line the problem was in – rather than trapping the error at the 'READ' stage of the program, which is no use to anybody. Most magazines prefer data to have checksums in it as it reduces the amount of people who think that it is the magazine at fault rather than their own typing.

The rest of the program will automatically self destruct – so save it first!

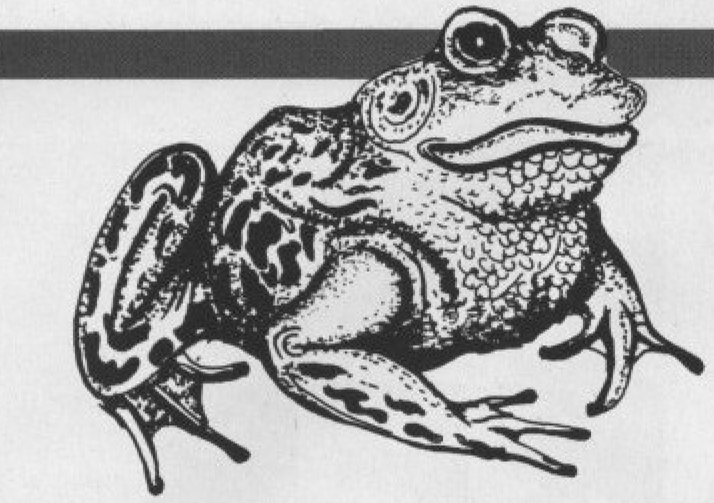
The program works by directly reading the data off the disk, dumping it to a buffer area in memory. This is then read and compiled into the data statements. The checksum is calculated as it goes. The rest of the program then pulls itself up by its bootstraps and kills itself off.

The problem for tape users is that the Commodore operating system does not allow you to read a non-data file off tape. For this you would have to carefully write a program that reads the code into memory and then writes it out byte-for-byte as a data file – remembering to make the first two bytes the load address in lo/hi format. The program could then be easily modified to read in the data file and convert this instead.

The program is restricted to 16K of code and 24K of Basic program data. This is because the Basic data will take up a lot more room than the original code, typically 3-4 times as much. So the buffer needs to be a lot smaller than the area left for Basic. I chose a 16/24 split because that is useful for most purposes. However, changing the pokes to locations 55/56 in the first line and the value of 'M' can alter this for a bigger or smaller proportion as you wish.

PROGRAM: DATA MAKER

```
0 POKE 55,00:POKE 56,96:CLR
   :X=FRE(0):PRINT"[CLEAR,
   DOWN4]INPUT NAME OF FILE";
   :INPUT N$
10 GOSUB 1000:S=2040:IC=10
   :PRINT"[CLEAR,DOWN3]FILE
   : ";N$:PRINT"LENGTH:"LF
   :PRINT"START: "SP
20 PRINT"END:[SPC3]"SP+LF
   :PRINT"[DOWN2,SPC10]ANY
    KEY TO CONTINUE"
30 GET A$:IF A$=""THEN 30
40 L$=STR$(S)+"DATA":CX=0
   :FOR D=0 TO 15
50 GOSUB 1200:CX=CX+A
   :L$=L$+MID$(STR$(A),2)+","
   :NEXT
60 PRINT"[BLUE,CLEAR]"+L$;
   MID$(STR$(CX),2)
65 PRINT"M="M":I="I":S="S"
   :IC="IC":X="X":SP="SP"
   :LF="LF":GOTO90"
70 POKE 198,3:POKE 631,19
   :POKE 632,13:POKE 633,13
   :END
90 POKE 53280,(PEEK(53280)AN
   D 15)+1
100 IF(S-2030)/10*16<LF THEN
    S=S+IC:GOTO 40
110 C=(S-2030)/10
120 L$="2000FORL=0TO"+MID$(S
   TR$(C-1),2)+":CX=0
   :FORD=0TO15:READA:CX=CX+A"
130 L$=L$+":POKE"+MID$(STR$(
   SP),2)+"+L*16+D,A:NEXTD"
140 PRINT"[CLEAR]"L$
   :PRINT"GOTO150":POKE 198,3
   :POKE 631,19:POKE 632,13
   :POKE 633,13:END
150 L$="2010R[SE]A
   :IFA<>CXT[SH]?"+CHR$(34)+
   "ERROR IN LINE"+CHR$(34)+
   ";2040+(L*10):ST[SO]"
160 PRINT"[CLEAR]"L$
   :PRINT"GOTO170":POKE 198,3
   :POKE 631,19:POKE 632,13
   :POKE 633,13:END
170 L$="2020NEXTL:END"
180 PRINT"[CLEAR]"L$
   :PRINT"GOTO190":POKE 198,3
   :POKE 631,19:POKE 632,13
   :POKE 633,13:END
190 I=1000
200 PRINT"[CLEAR]"I
   :PRINT"I="I":GOTO220"
210 POKE 198,3:POKE 631,19
   :POKE 632,13:POKE 633,13
   :END
220 I=I+10:IF I<1040 THEN 200
230 I=0
240 PRINT"[CLEAR]"I
   :PRINT I+10:PRINT"I="I"
   :GOTO260"
250 POKE 198,4:POKE 631,19
   :POKE 632,13:POKE 633,13
   :POKE 634,13:END
260 I=I+20:IF I<260 THEN 240
270 PRINT"[CLEAR]";
   :DATA 260,270,280,290,300,
   1200,1500,65,999
280 READ A:IF A=999 THEN PRI
   NT"?"+CHR$(34)+"[C7,CLEAR]
   "+CHR$(34)+":LIST"
   :POKE 53280,254:GOTO 300
290 PRINT A:GOTO 280
300 POKE 198,10:POKE 631,19
   :FOR I=0 TO 8:POKE 632+I,
   13:NEXT:END
1000 OPEN 1,8,3,N$+",P,R":I=0
   :M=24576
1010 GET#1,A$:IF A$=""THEN A
   $=CHR$(0)
1020 POKE M+I,ASC(A$):I=I+1
   :IF ST<>64 THEN 1010
1030 CLOSE 1:LF=I
   :SP=PEEK(M)+PEEK(M+1)*256
   :M=M+2:I=0:RETURN
1200 A=PEEK(M+I):I=I+1:RETURN
1500 A$="DATA MAKER"
   :OPEN 1,8,15,"S0:"+A$
   :CLOSE 1:SAVE A$,8
   :VERIFY A$,8:END
```



FROG

This month Daryl Bowers hasn't managed to move mountains but he's shifted some buildings instead.

IN THIS MONTH'S ARTICLE we have, as promised, the frog movement routines and a joystick reading routine. In addition to all that, you can have some moving buildings (Gasp! Shock! Horror!). Go on then, type it in!

The first routine is 'PLAYER', but its first line calls 'JOYREAD', so I'll deal with that immediately. This routine was taken straight from page 345 of the Programmer's Reference Guide (henceforth referred to as PRG) with full explanation, but I will just explain the values it returns. The registers on exit have the following values:

X – x direction movement
Y – y direction movement
A – nothing
Carry Flag – if clear then fire button pressed

Right, all clear? Now back to 'PLAYER'. This routine uses several variables which are all very simple to understand: 'JOYSTATUS' is zero when the firebutton is not pressed. 'NXYJUMP' is set to the next jump type (zero or one). 'MVLOOP' is the delay between Frog movements. We shall look at any others later on.

The first thing – having called 'JOYREAD' – is to see whether the firebutton is still pressed from the last jump, and if it is, to ignore it. If it is not pressed then 'JOYSTATUS' is set to zero so that the next depression of the firebutton will not be ignored. If the button is pressed and it had not been pressed previously, then 'JOYSTATUS' is set to one, and 'NXTJUMP' is set to one to make the next jump a large one. The effect of this is to make it necessary to press the firebutton and release it every time you want to make another jump – holding it down will have no effect after the first jump.

Which brings us to 'NOFIRE'. From here to 'NOMOVE' the program is concerned with movement in the X direction. First of all we decrease 'MVLOOP', and if it hasn't reached zero we branch straight to 'NOMOVE'. Next we replace 'MVLOOP' with 20 for the next time the routine is called.

Remembering that X still contains the value from 'JOYREAD' we now test to see if the joystick is being moved left or right. If zero then branch to 'NOMOVE'; if 255 (left) then branch to 'LEFTMV'. The next 15 lines move the Frog right by one pixel, and are identical except in reverse to 'LEFTMV', so I'll just explain this section.

The first thing we do is to test how far to the right the frog is situated on the screen. If this has reached its maximum then go to 'NOMOVE'. Otherwise we have two loops which increase all the X positions in the frog printing tables XTAB1 and XTAB1B.

Which brings us to 'NOMOVE'. From here to the end of the routine we have a short piece of code which causes new puddles to appear on the road, but this will have no effect until the full 'ROADFILL' routine is added next month. It starts off by decreasing a large two byte delay consisting of the variables 'CRATEDEL' as low-byte and 'CRATEDEL2' as high-byte, with a total delay value of 10*256=2560. This means that the routine will be used only every 2560th time.

Next we increase 'RANDPOS' the position in our table of random values 'RANDTAB'. If the value at this position is zero, then we branch to the end of the routine, 'NOCRAT'. If the value is one then we start a new puddle by storing 10 (the length of a puddle) in 'CRATER'. If it is 255 then we have reached the end of the table and so reset 'RANDPOS' to zero. (If you are wondering about the label names, the puddles started off by being black craters – but then I thought they looked better as blue puddles!)

Now we have arrived at 'PRBLDNG' – which if you haven't already guessed, is the routine to print the buildings on the far right of the screen as each new character is needed. First a breakdown of the variables used:

BLDNG1 – start address of buildings table
BLDNGTYPE – current building – 0 = no building
BLDNGSTAGE – character column in current building

Second a breakdown of the routine:

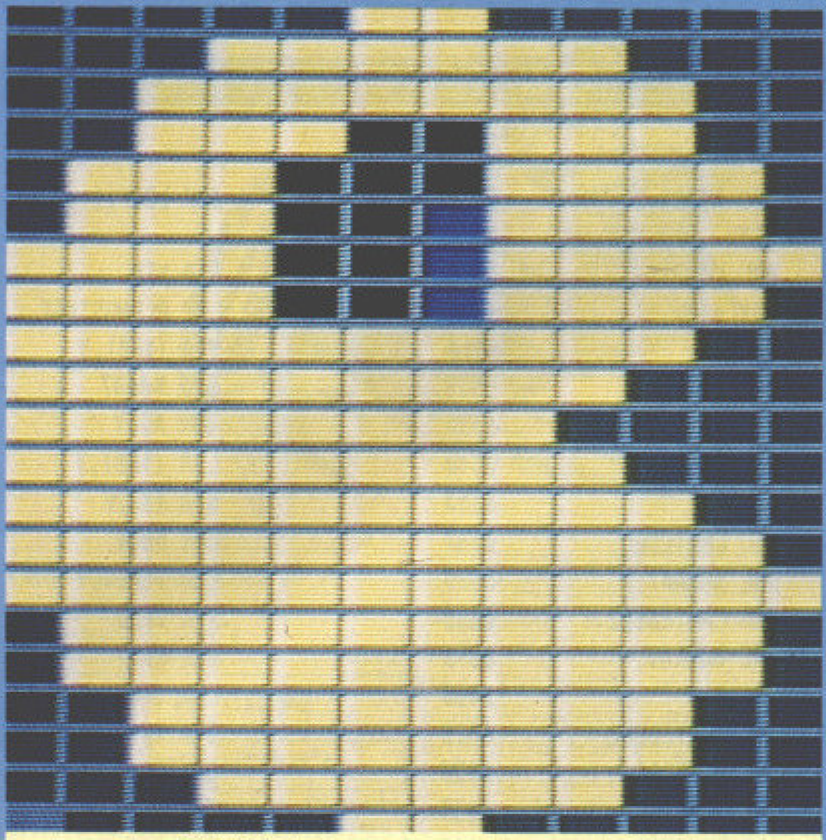
Lines

6150-6160 – Store hi-byte of 'BLDNG1' in $FC
6170-6180 – Check 'BLDNGTYPE' to see if it is 0 – if yes go to 'NOBLDNG'
6190-6270 – Decrease X (BLDNGTYPE): if not zero add 40 to A and repeat. (This sets up the correct position in the building table for the current building.)
6280-6410 – Retrieve and print characters of building pointed to by Y (BLDNGSTAGE)
6420-6470 – Increase 'BLDNGSTAGE' – if equal to 10 then go to 'NEWBLDNG'
6480-6520 – Add 10 to the value in Y
6530-6650 – Reset 'BLDNGSTAGE' to 0, get a new building type from 'BLDNGTAB' to put into 'BLDNGTYPE', and increase 'BLDNGPOS'
6660-6710 – Print a blank 'building' on the right of the screen
6720-6790 – Increase 'BLDNGSTAGE'; if equal to 10 then 'NEWBLDNG'
6810-6840 – As last month

So there we have it! Next month we have two super-duper routines to print our puddles and move and animate the Frenchman. See you soon!

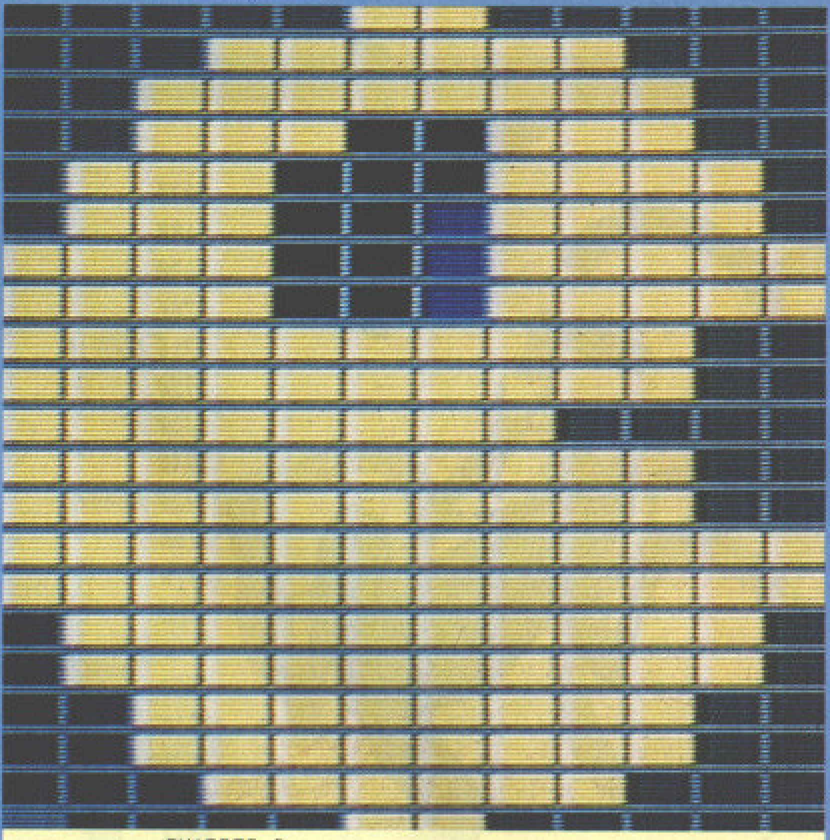



```
5250 PLAYER
5260            JSR JOYREAD
5270            LDA JOYSTATUS
5280            BEQ JOYOK
5290            BCC NOFIRE
5300            LDA #0
5310            STA JOYSTATUS
5320            JMP NOFIRE
5330 JOYOK
5340            BCS NOFIRE
5350            LDA #1
5360            STA JOYSTATUS
5370            LDA #1
5380            STA NXTJUMP
5390 NOFIRE
5400            DEC MVLOOP
5410            BNE NOMOVE
5420            LDA #20
5430            STA MVLOOP
5440            CPX #0
5450            BEQ NOMOVE
5460            BMI LEFTMV
5470            LDA XTAB1
5480            CMP #$F0
5490            BEQ NOMOVE
5500            LDX #31
5510 LOOP13
5520            INC XTAB1,X
5530            DEX
5540            BPL LOOP13
5550            LDX #47
5560 LOOP14
5570            INC XTAB1B,X
5580            DEX
5590            BPL LOOP14
5600            JMP NOMOVE
5610 LEFTMV
5620            LDA XTAB1
5630            CMP #110
5640            BEQ NOMOVE
5650            LDX #31
5660 LOOP15
5670            DEC XTAB1,X
5680            DEX
5690            BPL LOOP15
5700            LDX #47
5710 LOOP16
5720            DEC XTAB1B,X
5730            DEX
5740            BPL LOOP16
5750 NOMOVE
5760            DEC CRATEDEL
5770            BNE NOCRAT
5780            DEC CRATEDEL2
5790            BNE NOCRAT
5800            LDA #10
5810            STA CRATEDEL2
5820            INC RANDPOS
5830            LDY RANDPOS
5840            LDA RANDTAB,Y
5850            BEQ NOCRAT
5860            BPL NEWCRAT
5870            LDA #0
5880            STA RANDPOS
5890 NEWCRAT
5900            LDA #10
5910            STA CRATER
5920 NOCRAT
5930            RTS
5940            ;
5950 JOYREAD
5960            LDA $DC00
5970            LDY #0
5980            LDX #0
5990            LSR A
6000            BCS DJR0
6010            DEY
6020 DJR0       LSR A
6030            BCS DJR1
6040            INY
6050 DJR1       LSR A
6060            BCS DJR2
6070            DEX
6080 DJR2       LSR A
6090            BCS DJR3
6100            INX
6110 DJR3       LSR A
6120            RTS
6130            ;
6140 PRBLDNG
6150            LDA #BLDNG1/256
6160            STA $FC
6170            LDX BLDNGTYPE
6180            BEQ NOBLDNG
6190            LDA #BLDNG1&255
6200 LOOP11
6210            DEX
6220            BEQ POSCORRECT
6230            CLC
6240            ADC #40
6250            BCC NEX11
6260            INC $FC
6270 NEX11      JMP LOOP11
6280 POSCORRECT
6290            STA $FB
6300            LDY BLDNGSTAGE
6310            LDA ($FB),Y
6320            STA $0607
6330            JSR ADDY
6340            LDA ($FB),Y
6350            STA $062F
6360            JSR ADDY
6370            LDA ($FB),Y
6380            STA $0657
6390            JSR ADDY
6400            LDA ($FB),Y
6410            STA $067F
6420            LDY BLDNGSTAGE
6430            INY
6440            CPY #10
6450            BEQ NEWBLDNG
6460            STY BLDNGSTAGE
6470            RTS
6480 ADDY       TYA
6490            CLC
6500            ADC #10
6510            TAY
6520            RTS
6530 NEWBLDNG
6540            LDY #0
6550            STY BLDNGSTAGE
6560            LDX BLDNGPOS
6570            LDA BLDNGTAB,X
6580            BPL OK11
6590            TYA
6600            TAX
6610 OK11
6620            STA BLDNGTYPE
6630            INX
6640            STX BLDNGPOS
6650            RTS
6660 NOBLDNG
6670            LDA #32
6680            STA $0607
6690            STA $062F
6700            STA $0657
6710            STA $067F
6720            LDY BLDNGSTAGE
6730            INY
6740            CPY #10
6750            BNE OK12
6760            JMP NEWBLDNG
6770 OK12
6780            STY BLDNGSTAGE
6790            RTS
6800            ;
6810 ROADFILL
6820            LDA $06D0
6830            STA $06D0+$27
6840            RTS
6850 FINISH
6860            .END
```



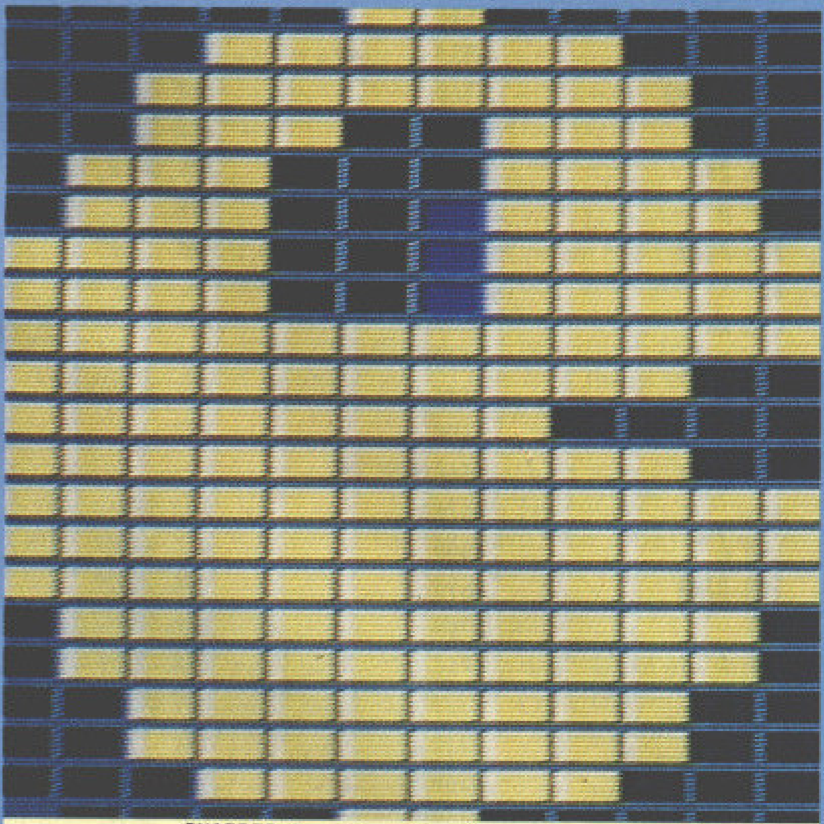
SNAPPER 1

```
DATA000,040,000,002,170,128,010,170
DATA160,010,150,160,042,086,168,042
DATA094,168,170,094,170,170,094,168
DATA170,170,160,170,170,128,170,170
DATA000,170,170,128,170,170,160,170
DATA170,168,170,170,170,042,170,168
DATA042,170,168,010,170,160,010,170
DATA160,002,170,128,000,040,000,000
```



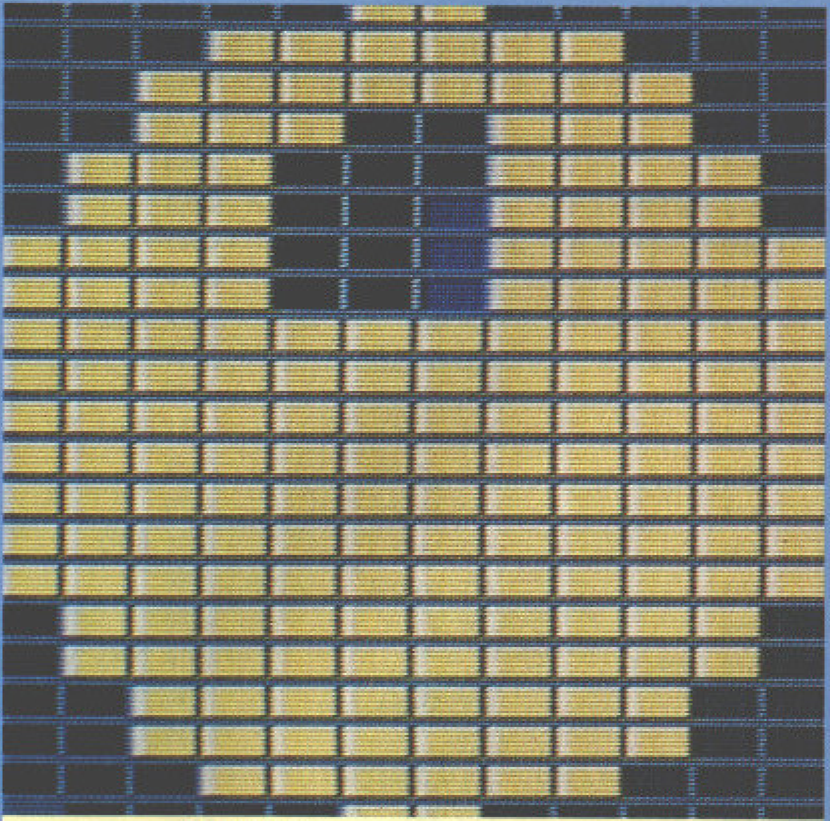
SNAPPER 2

```
DATA000,040,000,002,170,128,010,170
DATA160,010,150,160,042,086,168,042
DATA094,168,170,094,170,170,094,170
DATA170,170,160,170,170,160,170,170
DATA000,170,170,160,170,170,160,170
DATA170,170,170,170,170,042,170,168
DATA042,170,168,010,170,160,010,170
DATA160,002,170,128,000,040,000,237
```



SNAPPER 3

```
DATA000,040,000,002,170,128,010,170
DATA160,010,150,160,042,086,168,042
DATA094,168,170,094,170,170,094,170
DATA170,170,170,170,170,160,170,170
DATA000,170,170,160,170,170,170,170
DATA170,170,170,170,170,042,170,168
DATA042,170,168,010,170,160,010,170
DATA160,002,170,128,000,040,000,239
```



SNAPPER 4

```
DATA000,040,000,002,170,128,010,170
DATA160,010,150,160,042,086,168,042
DATA094,168,170,094,170,170,094,170
DATA170,170,170,170,170,170,170,170
DATA170,170,170,170,170,170,170,170
DATA170,170,170,170,170,042,170,168
DATA042,170,168,010,170,160,010,170
DATA160,002,170,128,000,040,000,024
```

SPRITE IDEAS

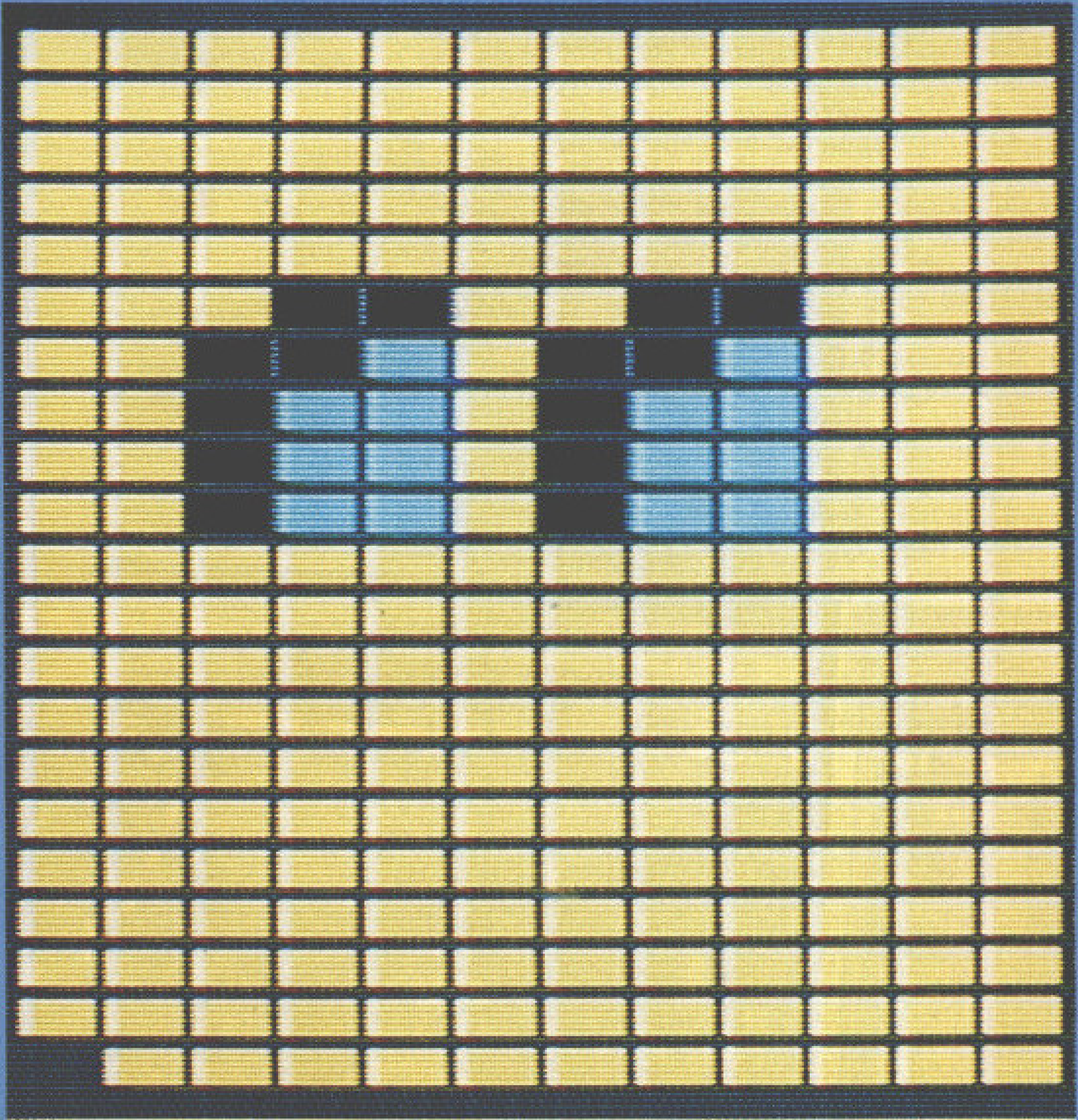
When you are designing a game one of the longest jobs is designing the sprites. If you are good at art then fine, if not your next monster will probably end up looking like a square box with legs.

Now, Your Commodore comes to the rescue once again with Sprite Ideas. If you have designed any sprites for games and you don't mind other people seeing your masterworks then why not send them into us. Each month we will be offering £10 for the best entries.

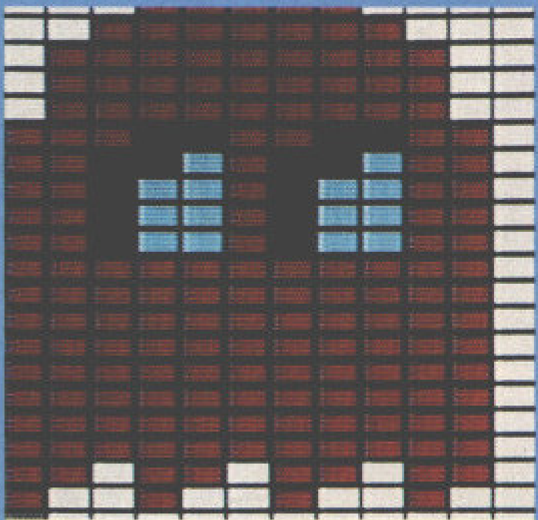
Your sprites can be anything at all (within reason), if you've designed a series of animated characters then send in the lot. We'd love to have a look at them.

So, next time you are after an Ogre to put in your new game, have a look in this section of the magazine and you may find just what you are looking for.

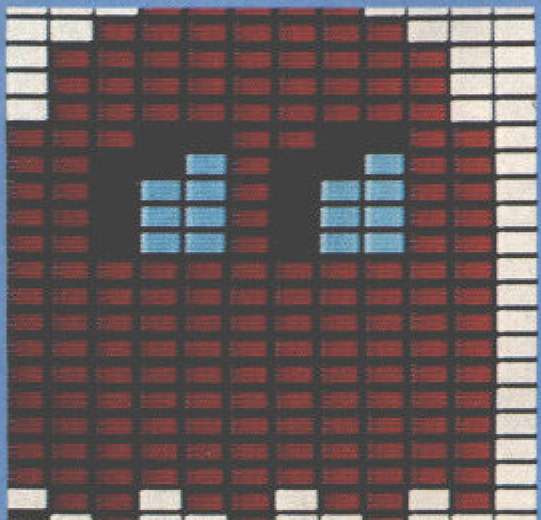
This month we are pleased to print an excellent series of Pacman sprites by Robin Davis from Redruth



```
GHOST 1
DATA002,170,000,010,170,128,042,170
DATA160,042,170,160,042,170,160,169
DATA105,104,165,229,232,167,231,232
DATA167,231,232,167,231,232,170,170
DATA168,170,170,168,170,170,168,170
DATA170,168,170,170,168,170,170,168
DATA170,170,168,170,170,168,162,138
DATA040,130,008,032,000,000,000,020
```



```
GHOST 2
DATA002,170,000,010,170,128,042,170
DATA160,042,170,160,042,170,160,169
DATA105,104,165,229,232,167,231,232
DATA167,231,232,167,231,232,170,170
DATA168,170,170,168,170,170,168,170
DATA170,168,170,170,168,170,170,168
DATA170,170,168,170,170,168,170,170
DATA168,040,162,136,008,032,128,236
```



```
DATA EYES
DATA000,000,000,000,000,000,000,000
DATA000,000,000,000,000,000,000,001
DATA065,064,005,197,192,007,199,192
DATA007,199,192,007,199,192,000,000
DATA000,000,000,000,000,000,000,000
DATA000,000,000,000,000,000,000,000
DATA000,000,000,000,000,000,000,000
DATA000,000,000,000,000,000,000,239
```

Eric Doyle has been wearing out his joystick on Mastertronic C-16 range.

C16 BY MASTERTRONIC

SOFTWARE SUPPORT FOR THE C-16 IS steadily growing and Mastertronic's range of games offers good quality at the extremely low price of £1.99 each.

I looked at seven of the titles: *Tutti Frutti, Squirm, Vegas Jackpot, Big Mac, BMX Racers and Formula 1 Simulator.*

Despite the lack of detailed gameplay instructions, I discovered the full rules by trial and error, which added a bit of spice to the early stages of playing.

Tutti Frutti was a prime example of living by my wits. All you are told is that "Your job is to collect all the cherries from the orchard, as they are now ripe and it's fruit picking time". The instructions then warn the player not to stand under any bad apples and to avoid the members of the acid apple gang. Beyond this you are on your own.

My previous experience with the Mr Do type of game helped me to cope with the first screen. This involved collecting cherries while being pursued by the acid apple gang. Donning my secret identity of Super Strawberry, the King of the Orchard and burrowing through the orchard to collect the cherries was a relatively simple task, despite the falling apples and the attempts of the gang to foil my efforts.

Screen two offered more of the same kind of problem but proved to be slightly harder. After harvesting the fruit I was dismayed to find that the screen didn't change. Perplexed, I wandered about the screen undermining apples and zapping gangsters for the sake of something to do. Still nothing happened until the penny dropped or, more accurately, all of the apples dropped. To complete this phase you had to get all of the apples to the bottom of the screen. Easy once you know the secret!

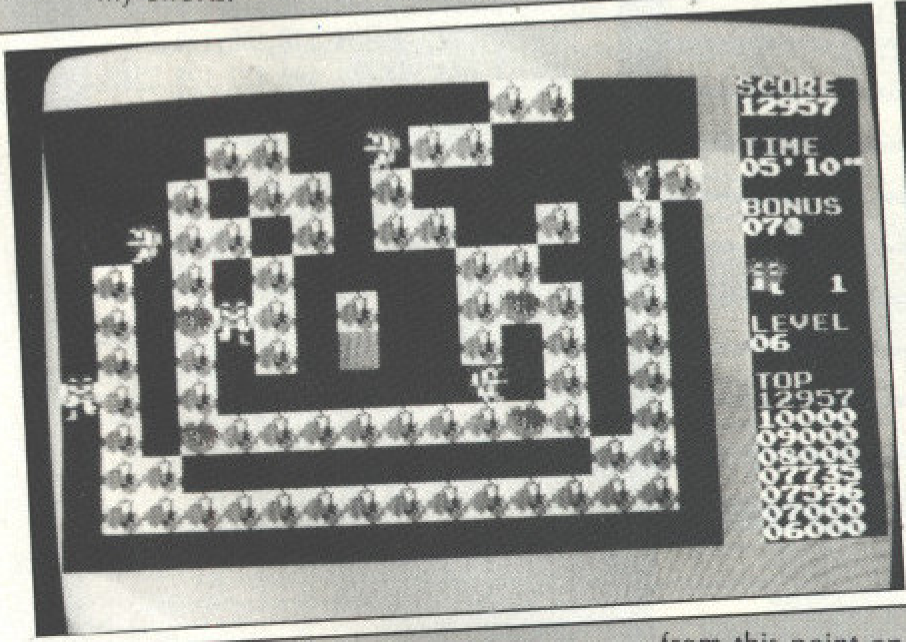
The third screen had me totally foxed until I realised that the idea now was to push cherry labelled boxes at the gang to eliminate them all in a Pacman-like maze. After eating cherries on all the other screens a word of explanation would have been nice here. Thank goodness I'd now explored every type of screen because from this point on, though the difficulty level rises gradually, the cycle of screens follows the same pattern ad infinitum.

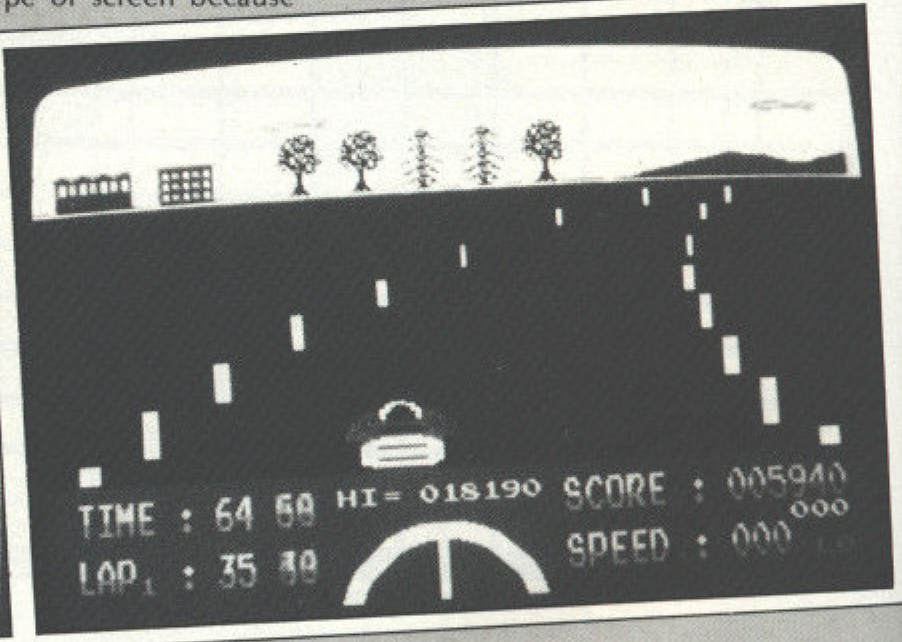
There was I, happily ignoring the instructions, when all of a sudden the lights go out and there I am in the dark groping along the passage walls. To prevent this from happening you must snap up the elusive glow worms which appear from time to time.

Success brings screen after screen of inventive mazes. This gives little time for boredom to set in despite the lack of variation in the gameplay and, just when you think you've sussed it all out, nasty little twists are introduced. As you disappear down an invisible wormhole for the first time, you wonder what on earth is happening and you start to worry once more about every move you make.

One of my all-time favourite games is Boulderdash, which must surely have inspired Mastertronic's Rockman. Not that the two games are alike in anything other than the general theme of collecting diamonds and avoiding falling rocks. This epitomises what I like about this series of games: although the themes of the games follow traditional lines there is an obvious attempt to innovate and to create interesting fusions of ideas rather than just doing a cheap copy of a successful game.

The place is Africa in the 1890's and mining fever has struck Ricky Rockman. His self-imposed task is to collect diamonds by dashing about the screen pushing boulders around and avoiding the baddies, a definite case of only being here for De Bere.





Apart from being a danger, the apples can offer valuable assistance by blocking the path of the gangsters or by crushing a pursuer who gets underneath a falling Granny Smith.

Although it is not mentioned in the instructions, the strawberry does possess a disk which can be thrown in the direction of an attacker. If the disk misses its mark it will bounce around the screen until Super Strawberry collects it or it eventually hits its mark when it will automatically return to its owner for re-use, just like a boomerang.

The next game for consideration was Squirm, which at first resembles our old friend Pacman. In this game the mazes are not inhabited with the usual ghosts but with three long wriggling worm-like creatures called squirms. One of the squirms lays eggs, as it negotiates the pathways of the maze, the others collect the eggs up again. I had to squeeze in somewhere amongst all this so that I could collect all the eggs before the squirms got to them.

The game blends quick thinking with strategy, two almost contradictory requirements because the speed at which Ricky's air runs out leaves very little time to plan a route and calculate the consequences of your actions. The random element of baddies wandering about undermining rocks and generally messing up your strategy only adds to the feeling of panic.

Given that all of the diamonds are recoverable, the strategem involves how

to move the rocks and in what order the diamonds must be tackled. One wrong move and a gem will be trapped forever. Success is rewarded by the exit sign flashing but what if the doorway has become blocked by falling debris? Have no fear, another exit appears elsewhere and if you die in your attempts to reach the door the game resets the boulders to their original position and all you have to do is to dash for the exit.

All in all, it's great entertainment for gamesters with trogladytic tendencies.

Las Vegas is the gambling capital of the world, Monaco without the monacle, the brashest side of the American dream. This forms a fitting backdrop for Vegas Jackpot, the fruit machine simulator. The strange fascination which the good old one-armed bandits holds is a mystery to me but addictive they certainly are. Even when the money is only an electrical impulse in the heart of the machine the compulsion to play is still there. Perhaps it is the crude analogy to life in this technocratic society. Perhaps the man/machine interface has become a crucial element in society. Perhaps I'd better get on and review this game!

The object of the game is to break the bank by winning more than £250. You start the game with £100 and each pull of the lever costs £1. How you play is your own decision. You can pump the machine full of cash or you can feed it up as you go along. The winning 250 quid has to be in your possession, not in the machine, so I found that my tactic was to keep feeding in the cash in £10 blocks.

The machine resembles a normal four drum fruit machine with all the usual features: cherries, melons, lemons etc. Reading from the left of the display, if a row of two or more of the same fruit is revealed at the end of a spin, a sum of money is awarded depending on the number in the row and the probability of the combination appearing.

A win allows you to gamble or just to collect your winnings. If you gamble successfully you are allowed another gamble and so on until you decide to quit while the going's good or the win equals £100. After a little while I found that I could successfully time my gamble to win every time. After two or three such wins Galley 89/c16-mastertronic/3

Alternatively, some of the fruits have numbers and if a row has a value greater than six a number of nudges are awarded. These nudges may also be gambled but the stakes are higher because a nudge nearly always given a win but if you gamble you can lose all your nudges and be left with nothing more than a free spin.

If a higher winning value was set for this game it would have been more challenging . And the graphical representation is adequate but I feel it could have been given greater aesthetic appeal.

More Adventurers of Big Mac the Mad Maintenance Man has as much to do with hamburgers and clowns called Ronald as it has to do with maintenance work. What it actually involves is a secret agent whose mission is to close down an enemy power plant. The air in each chamber of the plant is limited so the work has to be done quickly.

The first few problems are simply a matter of timing but gradually more and more thought has to go into the game. Zapping guns and levers to pull, as well as collapsing floors all add to the nightmare.

One excellent game feature is the ability to skip through all of the screens you have completed in previous games at the beginning of a new game. This means tht you can progress faster and see what the game has to offer. If only this kind of facility was included in every multiscreen epic. A coded entry at the beginning of a session would have been even better so that you could carry your progress on from day to day.

The graphics are simple but effective and some of the strategy problems are very difficult to crack because, on the later screens, the exit is not usually revealed until near the end. By this time you've probably destroyed the only route available and keyboard suicide is the only way out.

This was one of my two firm favourites, unlike BMX Racers with which I was most impressed until the bugs bit.

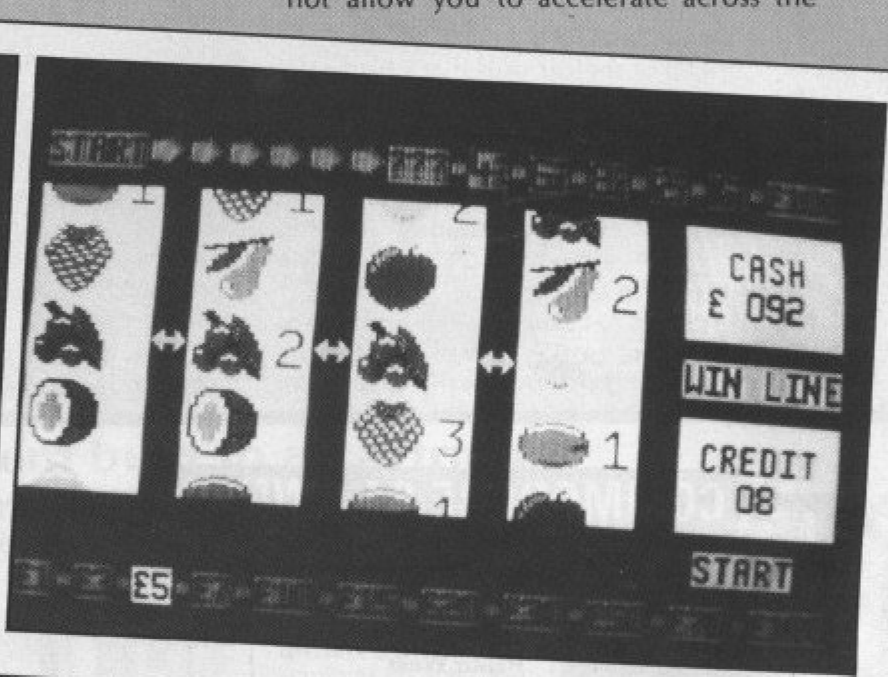
The idea behind BMX is to negotiate courses as quickly as possible, collecting flags and energy on the way. Playing each track is challenging but there are more challenges here than was ever dreamed of in Mastertronic's philosophy, methinks.

No doubt they would rather I described these 'extra' features as a characteristic of the game, in much the same way as a car salesman would describe a scratch on a new Rolls Royce as a street-cred feature and charge extra for it. Bugs, I call them, for bugs they are. Is it fair that a game which has to be completed as quickly as possible does not allow you to accelerate across the finish line? Actually, to be fair, it does allow the acceleration but it does not detect your bike crossing the line so you disappear off the top of the screen into a netherworld where you must wait until your energy runs out. Similarly if you are picking up a flag or an energy pill you fail if you are accelerating. Even some of the obstacles can be passed by accelerating through them.

The scoring system leaves a lot to be desired as well. Slow progress is rewarded with a higher score than a fast run because score increases with time. The essential element of a race is that of time, and convention states that the faster the competitor the greater the reward. Still, Mastertronic broke with convention when they were the first to venture into low price products so perhaps they are ready now to challenge game concepts as well.

My last beef relates to the power pills at the end of the second screen: why can't I pick it up?. Perhaps there are no more





screens beyond it – another revolutionary concept!

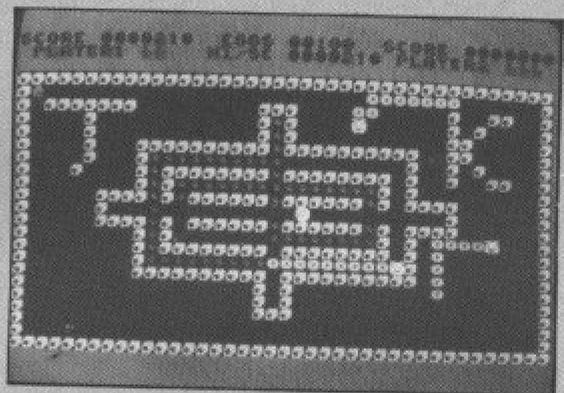
Come on Mastertronic get your act into gear. You can produce good quality stuff so make sure that you play test sufficiently to get rid of such obvious problems.

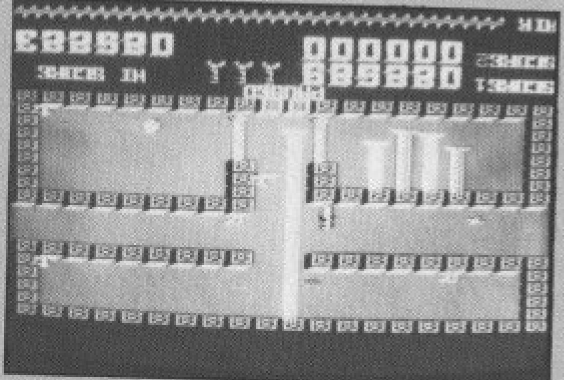
Turning now from the dross to the gloss, Formula 1 Simulator is hard to beat. As more and more driving simulators appear, it is heartening to see that at least one company can produce a game which occupies so little memory and costs so little money but can seriously take its place amongst the rest and wipe the floor with most.

The quality of the graphics is first class giving a smooth scrolling horizon with features such as skyscrapers and bridges which help you to work out your orientation on the course. Using these landmarks, you soon learn which way the next bend is liable to go and can align your car accordingly.

Control of the car uses five keys or the four main joystick positions and the fire button, controlling accelerate, brake, left, right and change gear (lo or hi). Visual confirmation of the degree of directional change is given by a rotating steering wheel which allows you to make fine adjustments in alignment.

The idea is to complete as many laps of the course as possible within the time limit which is displayed to the left of the steering wheel. Any extra time at the end of a lap is carried forward to the next one which is invariably trickier, which more cars and more swerving to be avoided.





All of these games except Squirm have keyboard alternatives to joystick operation. If only more companies showed the same consideration.

Given that in all but one case, if the type of game appeals to you then you will not be disappointed, I will venture to arrange them in some order of preference.

Formula 1 Simulator and Big Mac I find hard to separate as equal favourites. This is because they test different abilities. Formula 1 is all action but Big Mac requires a lot of thought and perseverence.

Rockman is extremely challenging but not as varied as Mac, but beats Squirm and Tutti Frutti for the same reasons.

Vegas Jackpot comes at the bottom of this list purely because it is such an oddity. You either like fruit machines or you don't. Personally, I enjoyed the game but the skill demanded is minimal.

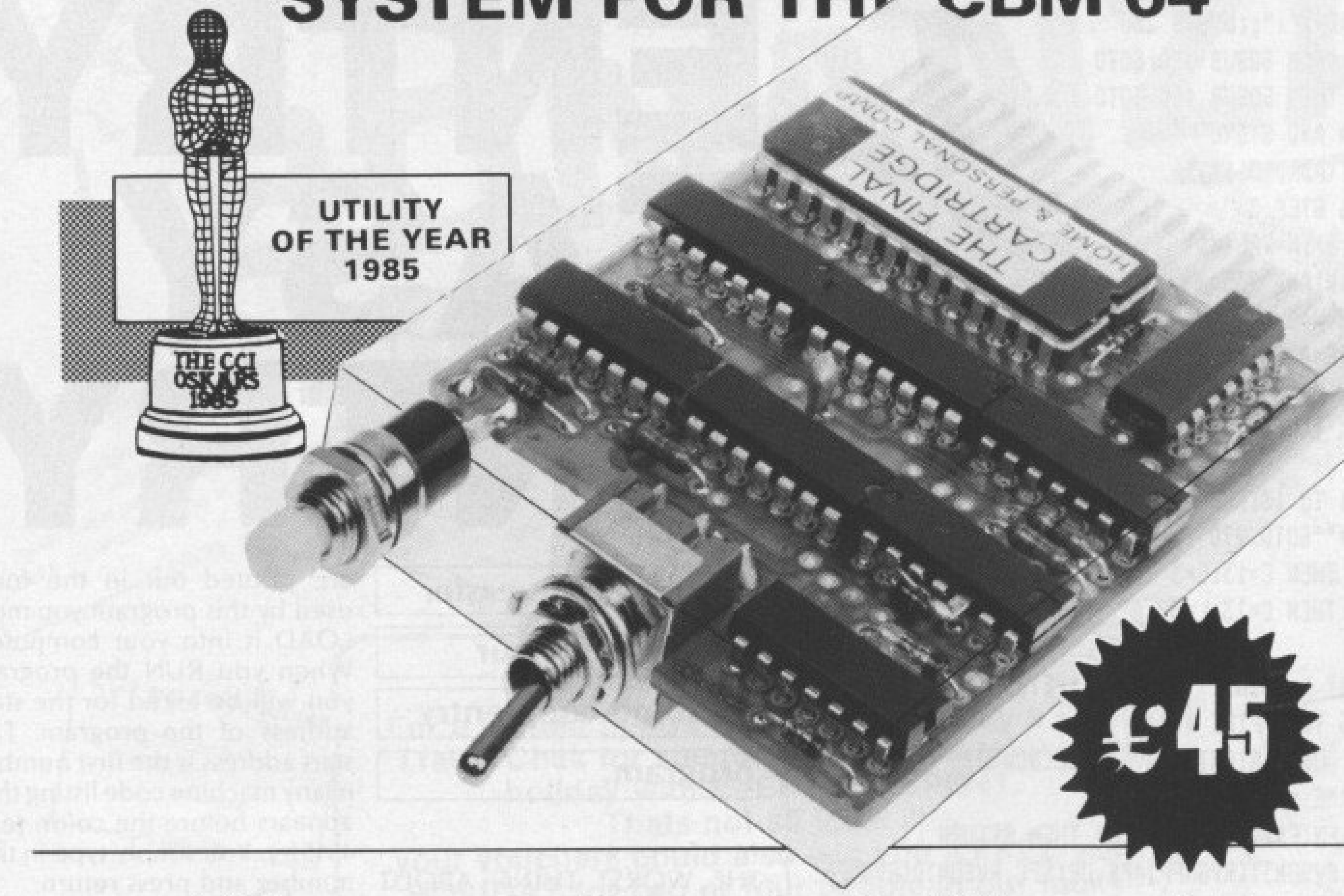
Oh yes, there's still BMX Racers to evaluate, I'd almost forgotten. Thank goodness!

I am amazed at the value of Mastertronic's catalogue of games. Admittedly there are several which even they would prefer to forget, but in general the quality is excellent when weighed up against price. I remember the caution with which I received their first offerings and as for selling computer games in newsagents! OK so everyone makes the odd mistake, I'm not infallible.

Next month I hope to cast a wary eye over Gremlin Graphics assortment for the C-16 – Gremlin seems very pleased with them. Watch this space for an independent view.

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* works with C128 in the 64 mode.

```
100 INPUT "[CLEAR,DOWN2]START ADDRESS ";ADR
110 PRINT "[DOWN2]PLEASE ENTER ALL DIGITS."
120 PRINT"[DOWN2]SPACES WILL BE ENTERED AUTOMATICALLY
   [DOWN2]"
130 PRINT:PRINT ADR;":";:GOSUB 260
140 IF S$="[F1]" THEN GOSUB 330:GOTO 100
150 IF S$="[F3]" THEN GOSUB 460:GOTO 100
160 REM READ DATA AND STORE
170 CHECK=ADR-INT(ADR/256)*256
180 FOR C=1 TO 36 STEP 3
190 N$=MID$(S$,C,3):N=VAL(N$)
200 CHECK=(CHECK+N)AND 255
210 IF N>255 THEN N=0
220 POKE ADR,N:ADR=ADR+1:NEXT C
230 VFY=VAL(RIGHT$(S$,3))
240 IF VFY<>CHECK THEN GOSUB 530:GOTO 130
250 GOTO 130
260 S$="":FOR C=1 TO 13:FOR L=1 TO 3
270 GET K$:IF K$=""GOTO 270
280 IF K$="[F1]" THEN C=13:L=3
290 IF K$="[F3]" THEN C=13:L=3
300 S$=S$+K$
310 PRINT K$;:NEXT L:PRINT" ";:NEXT C:RETURN
320 REM **** SAVE YOUR FILE ****
330 PRINT"[CLEAR,DOWN2,RIGHT2]SAVE FILE[DOWN2]"
340 INPUT"FILE NAME :";F$
350 IF F$="" OR LEN(F$)>15 OR F$="Q" THEN RETURN
360 INPUT"[DOWN3,RVSON]T[RVSOFF]APE OR[SPC,RVSON]D[RVSOFF]
   ISK : D[LEFT3]";D$
370 D=1:IF D$="D" THEN D=8
380 INPUT"[DOWN2]START ADDRESS IN DECIMAL :";S
390 INPUT"[DOWN]END ADDRESS IN DECIMAL[SPC4]:";E
400 TS$=F$:TO=PEEK(53)+256*PEEK(54)-LEN(TS$)
   :POKE 782,TO/256
410 POKE 781,TO-PEEK(782)*256:POKE 780,LEN(TS$)
420 SYS 65469
430 POKE 780,1:POKE 781,D:POKE 782,0:SYS 65466
440 POKE 254,S/256:POKE 253,S-PEEK(254)*256:POKE 780,253
450 POKE 782,(E+1)/256:POKE 781,(E+1)-PEEK(782)*256
   :SYS 65496:RETURN
460 REM **** LOAD DATA ****
470 INPUT"[CLEAR,DOWN2,RIGHT2]FILE NAME :";F$
480 IF F$="" OR LEN(Q$)>15 THEN RETURN
490 INPUT"[DOWN3,RVSON]T[RVSOFF]APE OR[SPC,RVSON]D[RVSOFF]
   ISK : D[LEFT3]";D$
500 IF D$<>"T"AND D$<>"D"THEN RETURN
510 D=1:IF D$="D"THEN D=8
520 LOAD F$,D,1:RETURN
530 PRINT:PRINT"[DOWN2,RIGHT]ERROR":ADR=ADR-12
540 POKE 54296,15:POKE 54277,10
550 POKE 54278,100:POKE 54273,45:POKE 54272,00
   :POKE 54276,17
560 FOR X=1 TO 250:NEXT
570 POKE 54276,0:POKE 54277,0:POKE 54278,0
580 RETURN
```

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THE WORST THING ABOUT Machine Code programming is entering thousands of numbers and then finding that the program will not work. There is nothing else that you can do apart from go through all of the listing trying to locate that mistyped character which prevents the program from working correctly.

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Using the Loader

Before you type in any machine code program you must have typed in the machine code entry program and have it saved onto tape or disk. When you want to enter any of the machine code programs that are printed out in the form used by this program you must LOAD it into your computer. When you RUN the program you will be asked for the start address of the program. The start address is the first number in any machine code listing that appears before the colon (e.g. 49152:). You simply type in this number and press return.

All that you have to do from then on is type in all the numbers on a line. Do not type any spaces and do not type return, the program will do all of that for you. If you have made a mistake on any line the computer will ask you to type the line again. Once the line is entered correctly the computer will automatically prompt you for the next line of data.

Saving and Loading

You can save your data to tape or disk at any time by simply entering the F1 key as the first character on any line. You will then be asked for the start and end address of the save. The start address is the first number in the listing as already mentioned. The end address is the number of the last line plus 11. Don't forget to add 11 or the last line entered will not be saved.

To load back a program that you have saved you simply have to enter the F3 key as the first item on a line. You will then be asked for the name of the program.

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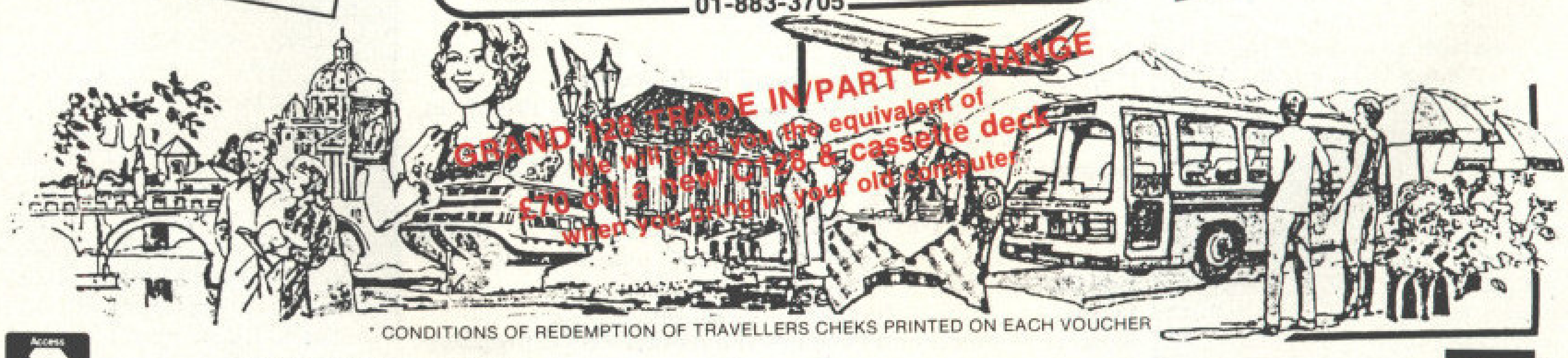
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HYPA BASIC

Steve Carrie provides an excellent extended Basic with built in assembler.

THIS PROGRAM IS A BASIC extension which, in addition to adding a few useful commands to the resident Basic, also includes an in-line 6502 assembler.

The main code sits in 4K of memory from $9000 to $9FFF (36864 to 40959). This means that there is 4K less Basic text space. However, this does leave the memory from $C000 (49152) onwards free for machine code programs.

Both tape and disk users may make use of this program. For disk users there are a couple of disk commands to make life easier.

Entering The Program

First type in the small Basic loader program. This will be used to load in and initialise the finished program. If you are using tape, save this as the first program on the tape with the finished utility after it.

Now type in and save the four main Basic listings before attempting to run them. Each program performs a check on the data to help guard against errors. If an error is detected, the line number is printed and execution aborted.

Program four includes instructions to save the finished program to a storage device. Be sure to change the device number in the SAVE command to one if you are using tape.

Load and run programs one to four in sequence. The completed program will be saved and the machine will reset. Now load the Basic loader and run it. When the loading is complete, the screen will change to grey with blue border and the power-up message will be issued along with the READY prompt.

Command Summary and Formats

Command	CLS
Format	CLS
Action	Clears the screen and homes the cursor
Command	HOME
Format	HOME
Action	Homes the cursor
Command	TYPE AT
Format	TYPE AT (row, column);<expression>
Action	Enables data to be printed at a specific screen location
Example	TYPE AT(10,14);"HELLO" Prints "HELLO" in the middle of the screen
Command	COLOUR
Format	COLOUR <border>,<screen>
Action	Sets border and screen colours
Example	COLOUR 5,15 Sets the border to green and the screen to grey
Command	DIR
Format	DIR [device]
Action	Displays directory of a disk in drive with device number [device]. The device number is optional and defaults to 8
Examples	DIR DIR 9
Note	The device number is either 8, 9, 10 or 11. Any other number will give a BAD DEVICE error
Command	CAT
Format	As for DIR
Action	As for DIR
Examples	As for DIR
Command	MERGE
Format	MERGE ["<filename>"][,<device>]
Action	Appends the named program to one already in memory
Examples	MERGE MERGE A$ MERGE "PROG",8
Command	EXEC
Format	EXEC ["<filename>"][,<device>]
Action	Loads and executes the named BASIC program
Examples	EXEC EXEC "PROG" EXEC "TEST",8

The Assembler

The assembler has been designed to work interactively with Basic. Source code is held in REM statements within a Basic program and assembled using the ASSEMBLE command. Basic variables may be passed to the assembler and different sections of code selectively assembled. The SET command is used to pass a value from the assembler to a Basic variable.

A typical program format is shown below. This simple program uses a machine-code subroutine to change the screen border colour to black.

```
10  ASSEMBLE 100,I
20  SET A="START"
30  SYS A
40  END
100 REM *=$C000
110 REM .BORDER=53280
120 REM !
130 REM .START:LDA # $00
140 REM STA BORDER
150 REM RTS
160 REM ]
```

Line 10 – instructs Basic to pass control to the assembler, begin assembling at line 100 and initialise the symbol table. If S was used instead of I — e.g. ASSEMBLE 100,S — then the symbol table would not be cleared. This is useful when

assembling multiple sections of code using the same symbols. (See Special Features section).

Line 20 — On return from assembly, the Basic variable A is given the value of assembler symbol START.

Line 30 — This is then used to call up the machine code.

Line 40 — Stops the program. Because the source code is in REMs, leaving out this line would not incur an error.

Line 100 — This sets the start of code to 49152 ($C000). The * directive must always be the first instruction in any source code program. (See Special Features section).

Line 110 — This sets the symbol BORDER to 53280.

Line 120 — The ! provides a means of inserting commands in source code.

Lines 130,140,150 — The machine code program. Note the use here of the symbol START to identify the beginning of the executable code.

Line 160 — The] signifies the end of the source code. Failure to include this at the end of the code will incur an error.

Assembler Directives

* Sets the code origin. This must be made the first line in a program. Failure to do so results in an error.

100 REM *=$8900

B: Byte directive. Allows byte-sized data to be inserted into a program.

120 REM # B:$20,$30,255,BYTE

#W: Word directive. Similar to #B: but works on 16-bit values.

240 REM #W:$3400,$1200, 53280, WORD

$ Text directive. Allows insertion of ASCII text.
300 REM $COMMODORE 64

! Comment — 20 REM ! THIS IS A COMMENT

] End of source directive. Must be the last line of a source program.

1000 REM]

. Define symbol. Only used when giving a symbol a value.

Command REN
Format REN [<line number>,<increment>]
Action Renumbers lines in a BASIC program. Does not renumber GOTO, GOSUB, etc.
Examples REN (start line 10, inc. 10)
REN 40,30 (start line 40, inc. 30)
Note * This command is direct mode only *

Command DEL
Format DEL <linenumber>,<linenumber>
Action Deletes lines in a Basic program. Giving a non-existent line incurs an error.
Examples DEL 40,70 (deletes lines 40-70)
DEL 1000,1100 (deletes lines 1000-1100)
Note * This command is direct mode only *

Command ALINE
Format ALINE [<linenumber>][,<increment>]
Action Provides automatic line numbering for easy insertion of Assembly-language. In addition to the line number, a REM is printed. Exit auto mode by entering a left arrow (←).
Examples ALINE (start 10, incr. 10)
ALINE 700 (start 70, incr. 10)
ALINE 70,20 (start 70, incr. 20)
Example of exiting auto mode
1070 REM]
1080 REM ← (entered ← to exit.)

Command OLD
Format OLD
Action Reverses the action of NEW, i.e. recovers a deleted program.
Note * will not work if an error has occurred since NEWing the program *

Command CSV
Format CSV <"filename">,<device>,0,<addr1>,<addr2>
Action Saves a block of memory <addr1> to <addr2> to the specified <device>
Example CSV "MC",8,0,36864,40959

Command CLD
Format CLD [<"filename">][,<device >],0][,<addr>]
Action Loads a block of memory from a device
Examples CLD
CLD "MC",1
CLD "MC",8,0,36864 (relocating load)

Command DISK
Format DISK "<command string>"[,<device>]
Action Sends a command to a disk drive. If no <device> is specified, default device 8 is used
Examples DISK "V"
DISK "S0:MC",9

Command COLD
Format COLD
Action Perform a code restart. Symbol table is reset

Command LOMEM
Format LOMEM <addr>
Action Sets bottom of memory for BASIC text. The message "ARE YOU SURE (Y/N)" will be issued. Relocation of the bottom of memory will occur only if reply is "Y".
Example LOMEM 16384
ARE YOU SURE (Y/N) (machine response)
Note * direct mode only *

270 REM .SCREEN=$D021
280 REM .START:LDA £0
290 REM STA SCREEN

Line 270 assigns the value $D021 to SCREEN.
Line 280 assigns the current code assembly address to START.
Line 290 shows how a symbol is referenced from within a command.
Note in line 280 that a colon (:) separates the symbol from the instruction. This convention must be followed and may be applied to multiple statements.

1000 REM INX:INX:INX:STX $70:RTS

will assemble correctly.

Assembler Operators

< Takes the low order byte of a 16-bit value.

200 REM LDA#<SYMBOL (low order byte)

> Takes the high order byte of a 16-bit value.

210 REM LDX #>SYMBOL (high order byte)

$ Hexadecimal number. The following number is to be treated as a hex quantity.

230 REM LDX #$70
240 REM STX $02

\# 6502 immediate mode (see line 230 above).

% Binary number. Treat the following number as an 8-bit binary number.

700 REM LDA #%00011011 (must be 8 digits)

' Treat the following character as an ASCII code.

710 REM LDY #'A

@ Used to evaluate the pointer to a Basic variable.

600 REM LDA# < @A (LOW ORDER)
610 REM LDY # >@A (HIGH ORDER)

Useful when using ROM floating point routines. Variable **must** be pre-defined in BASIC.

@Used to evaluate the VALUE of a Basic variable.

700 REM LDA #< @ Z
(LOW ORDER)
710 REM LDY #> @ Z
(HIGH ORDER)
Variable **must** be pre-defined in Basic.

NOTE: A decimal quantity has no special symbol.

400 REM LDA #0
410 REM STA 53280

Special Functions

The code origin directive * may be used in a special way. Consider the following example.

Two separate programs are required to fill consecutive blocks of memory begining at 49152 ($C000). The first program declares all symbols to be used. The second program therefore requires the symbol table intact. The second program may also define symbols but not those defined in the first program. Any symbols defined here cannot be used by preceeding programs.

Program 1

10 ASSEMBLE 100,I
20 EXEC "PROG2",8
100 REM *=$C000
110 REM .BORDER=$D020
120 REM .SCREEN=BORDER+1
130 REM LDA #0
140 REM STA SCREEN
150 REM]

Program 2

10 ASSEMBLE 100,S
20 END
100 REM *
110 REM LDA #10
120 REM STA BORDER
130 REM RTS
140 REM]

In Program 2, the code origin directive was given no address. This reads as "follow on from last address". Be careful with this one. Be sure to give the full command if no follow-on is required. This follow-on feature allows large linked files to be assembled. The main limiting factor is the symbol table.

Command HIMEM
* Similar to LOMEM but sets top of Basic text memory *

Command SET
Format SET <variable>="<assembler symbol>"
Action Assigns the value of an assembler symbol to a Basic numeric variable
Examples SET A="SYM1"
SET B%="SYM2"

Command ASSEMBLE
Format ASSEMBLE <linenumber>,<command>
Action Passes control of the system to the assembler Interpretation of source code will begin at the specified line number.
There are two possible commands
I – Clear symbol table
S – Preserve symbol table
Examples ASSEMBLE 220,S
ASSEMBLE 750,I

PROGRAM: HYPA LOAD

```
10 A=A+1:IF A<>1 THEN SYS 394
   24
20 POKE 53280,0:POKE 53281,0
30 PRINT"[CLEAR,C7,DOWN2,
   RIGHT2,SPC4]**[SPC3]
   BASIC/ASSEMBLER 64[SPC3]**"
40 PRINT"[DOWN2,RIGHT14]
   PLEASE WAIT"
50 PRINT"[RIGHT14]***********"
60 LOAD"IBACODE64",8,1
```

PROGRAM: PART1

```
10 S=36864
20 FOR LN=100 TO 730 STEP 10
   :T=0
30 FOR V=1 TO 16:READ A:T=T+A
40 POKE S,A:S=S+1:NEXT
50 READ CS:IF T<>CS THEN PRIN
   T"[DOWN]DATA ERROR IN LINE
   ";LN:END
60 NEXT
70 PRINT"[DOWN]NOW LOAD PART2"
80 END
100 DATA 255,105,101,117,255,
   109,125,121,97,113,255,255,
   41,37,53,255, 2294
110 DATA 45,61,57,33,49,255,
   10,255,6,22,255,14,30,255,
   255,255, 1857
120 DATA 255,255,255,36,255,
   255,44,255,255,255,255,255,
   255,201,197,213, 3496
130 DATA 255,205,221,217,193,
   209,255,255,224,228,255,
   255,236,255,255,255, 3773
140 DATA 255,255,255,192,196,
   255,255,204,255,255,255,
   255,255,255,255,198, 3850
150 DATA 214,255,206,222,255,
   255,255,255,255,73,69,85,
   255,77,93,89, 2913
160 DATA 65,81,255,255,255,
   230,246,255,238,254,255,
   255,255,255,255,255, 3664
170 DATA 255,255,255,76,255,
   255,255,255,108,255,255,
   255,255,255,32,255, 3531
180 DATA 255,255,255,255,255,
   169,165,181,255,173,189,
   185,161,177,255,255, 3440
190 DATA 162,166,255,182,174,
   255,190,255,255,255,255,
   160,164,180,255,172, 3335
200 DATA 188,255,255,255,255,
   74,255,70,86,255,78,94,255,
   255,255,255, 3140
210 DATA 255,9,5,21,255,13,29,
   25,1,17,255,42,255,38,54,
   255, 1529
220 DATA 46,62,255,255,255,
   255,106,255,102,118,255,
   110,126,255,255,255, 2965
230 DATA 255,255,233,229,245,
   255,237,253,249,225,241,
   255,255,255,133,149, 3724
240 DATA 255,141,157,153,129,
   145,255,255,255,134,255,
   150,142,255,255,255, 3191
250 DATA 255,255,255,255,132,
   148,255,140,255,255,255,
   255,255,66,67,67, 3170
260 DATA 144,66,67,83,176,66,
   69,81,240,66,77,73,48,66,
   78,69, 1469
270 DATA 208,66,80,76,16,66,
   86,67,80,66,86,83,112,67,
   76,67, 1302
280 DATA 24,67,76,68,216,67,
   76,73,88,67,76,86,184,68,
   69,88, 1393
```

Possible Extra Error Messages

OUT OF SOURCE	The] directive was not found before the end of the source code.
NOT AN OPERATION	The assembler was expecting a 6502 mnemonic but failed to find one.
TOO MANY SYMBOLS	Symbol table is full.
SYMBOL REDEF'D	Symbol defined twice.
UNDEF'D SYMBOL	A symbol was referenced to but was not defined.
BRANCH RANGE	Relative branches have a limited range of –128 to +127.
SYMBOL SYNTAX	Symbols must not begin with A.
DIRECTIVE	The * directive was incorrect.
ILLEGAL PROGRAM MODE	Command is direct mode only.
BAD DEVICE	Illegal device specification.

Special Notes

Avoid the following areas:

$02A7-$02FF — assembler temp variables
$0334-$0350 — assembler temp variables
$9000-$9FFF — main program
$A000-$BFFF — symbol table

I hope that these examples help to show some of the uses of the assembler. I would be grateful to hear of any ideas and/or alterations. Write to — Steve Carrie at the Your Commodore office.

```
290 DATA 202,68,69,89,136,73,78,88,232,73,78,89,200,80,72,
   65, 1692
300 DATA 72,80,72,80,8,80,76,65,104,80,76,80,40,82,84,73,
   1152
310 DATA 64,82,84,83,96,83,69,67,56,83,69,68,248,83,69,73,
   1377
320 DATA 120,84,65,88,170,84,65,89,168,84,83,88,186,84,88,
   65, 1611
330 DATA 138,84,88,83,154,84,89,65,152,78,79,80,234,66,82,
   75, 1631
340 DATA 0,65,68,67,0,65,78,68,11,65,83,76,22,66,73,84, 891
350 DATA 33,67,77,80,44,67,80,88,55,67,80,89,66,68,69,67,
   1097
360 DATA 77,69,79,82,88,73,78,67,99,74,77,80,110,74,83,82,
   1292
370 DATA 121,76,68,65,132,76,68,88,143,76,68,89,154,76,83,
   82, 1465
380 DATA 165,79,82,65,176,82,79,76,187,82,79,82,198,83,66,
   67, 1648
390 DATA 209,83,84,65,220,83,84,88,231,83,84,89,242,79,85,
   84, 1893
400 DATA 32,79,70,32,83,79,85,82,67,197,66,65,68,32,79,80,
   1196
410 DATA 69,82,65,84,73,79,206,84,79,79,32,77,65,78,89,32,
   1273
420 DATA 83,89,77,66,79,76,211,83,89,77,66,79,76,32,82,69,
   1334
430 DATA 68,69,70,39,196,66,65,68,32,77,79,68,197,85,78,68,
   1325
440 DATA 69,70,39,68,32,83,89,77,66,79,204,66,82,65,78,67,
   1234
450 DATA 72,32,82,65,78,71,197,83,89,77,66,79,76,32,83,89,
   1271
460 DATA 78,84,65,216,68,73,82,69,67,84,73,86,197,66,65,68,
   1441
470 DATA 32,79,80,69,82,65,78,196,73,76,76,69,71,65,76,32,
   1219
480 DATA 80,82,79,71,82,65,77,32,77,79,68,197,66,65,68,32,
   1220
490 DATA 68,69,86,73,67,197,221,145,234,145,247,145,7,146,
   21,146, 2017
500 DATA 29,146,43,146,55,146,68,146,77,146,88,146,108,146,
   32,168, 1690
510 DATA 146,138,10,170,189,118,146,133,34,189,119,146,133,
   35,76,71, 1853
520 DATA 164,165,1,41,254,133,1,96,165,1,9,1,133,1,96,32,
   1293
530 DATA 138,173,76,247,183,201,48,144,18,201,71,176,14,
   201,58,176, 2125
540 DATA 3,41,15,96,201,65,144,3,233,55,96,76,72,178,32,
   121, 1431
550 DATA 0,32,181,146,10,10,10,10,133,2,32,115,0,32,181,
   146, 1040
560 DATA 5,2,133,2,76,115,0,32,206,146,165,2,133,20,169,0,
   1206
570 DATA 133,21,32,121,0,32,7,147,176,1,96,32,206,146,165,
   20, 1335
580 DATA 133,21,165,2,133,20,96,32,25,147,144,1,96,201,65,
   144, 1425
590 DATA 6,201,71,176,2,56,96,24,96,201,48,144,250,201,58,
   176, 1806
600 DATA 246,56,96,32,19,177,144,1,96,76,25,147,32,121,0,
   162, 1430
610 DATA 0,134,2,201,48,240,7,201,49,240,3,76,72,178,41,15,
   1507
620 DATA 5,2,133,2,32,115,0,232,224,8,208,1,96,6,2,76, 1142
630 DATA 51,147,32,175,146,32,19,166,144,1,96,76,131,174,
   165,122, 1677
640 DATA 166,123,141,192,2,142,193,2,162,9,181,57,157,194,
   2,202, 1925
650 DATA 16,248,96,162,9,189,194,2,149,57,202,16,248,173,
   192,2, 1955
660 DATA 174,193,2,133,122,134,123,96,160,0,177,122,133,61,
   200,177, 2007
670 DATA 122,208,5,162,0,76,142,146,133,62,200,177,122,133,
   57,200, 1945
680 DATA 177,122,133,58,96,165,61,166,62,133,122,134,123,
   32,136,147, 1867
690 DATA 200,152,24,101,122,133,122,165,123,105,0,133,123,
   96,165,95, 1859
700 DATA 166,96,76,169,147,0,160,255,191,173,197,147,174,
   198,147,133, 2429
710 DATA 63,134,64,72,32,161,146,104,160,0,197,253,208,11,
   228,254, 2087
720 DATA 208,7,162,0,32,168,146,24,96,177,63,205,60,3,208,
   24, 1583
730 DATA 170,232,134,2,200,185,60,3,209,63,208,12,200,196,
   2,208, 2084
```

PROGRAM: PART2

```
10 CLR:S=37888
20 FOR LN=100 TO 730 STEP 10:T=0
30 FOR V=1 TO 16:READ A:T=T+A
40 POKE S,A:S=S+1:NEXT
50 READ T1:IF T<>T1 THEN PRINT"[DOWN]DATA ERROR IN LINE";LN
   :END
60 NEXT
70 PRINT"[DOWN]NOW LOAD PART3"
80 END
100 DATA 244,162,0,32,168,146,56,96,169,9,24,101,63,133,63,
   165, 1631
110 DATA 64,105,0,133,64,170,165,63,76,216,147,32,19,177,
   176,5, 1612
120 DATA 162,7,76,142,146,160,0,177,122,32,35,147,144,11,
   153,61, 1575
130 DATA 3,200,192,7,208,241,76,32,148,140,60,3,24,152,101,
   122, 1709
140 DATA 133,122,165,123,105,0,133,123,96,32,201,147,176,3,
   162,5, 1726
150 DATA 96,32,161,146,160,7,177,63,133,90,200,177,63,133,
   91,32, 1761
160 DATA 168,146,32,121,0,201,43,240,7,201,45,240,3,76,152,
   148, 1823
```

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170 DATA 72,32,115,0,32,167,148,104,201,43,208,14,24,165,
   20,101, 1446
180 DATA 90,133,20,165,21,101,91,133,21,96,165,90,56,229,
   20,133, 1564
190 DATA 20,165,91,229,21,133,21,96,165,90,133,20,165,91,
   133,21, 1594
200 DATA 96,32,167,148,76,233,152,32,121,0,201,36,208,8,32,
   115, 1657
210 DATA 0,32,231,146,56,96,201,37,208,16,32,115,0,32,44,
   147, 1393
220 DATA 169,0,133,21,165,2,133,20,56,96,201,60,240,4,201,
   62, 1563
230 DATA 208,30,72,32,115,0,32,167,148,104,201,60,240,4,
   165,21, 1599
240 DATA 133,20,169,0,133,21,56,96,32,115,0,32,175,146,56,
   96, 1280
250 DATA 201,64,240,244,201,94,208,13,32,232,148,165,71,
   166,72,133, 2284
260 DATA 20,134,21,56,96,32,25,147,144,5,32,175,146,56,96,
   201, 1386
270 DATA 39,208,14,32,115,0,133,20,169,0,133,21,32,115,0,
   56, 1087
280 DATA 96,32,19,177,176,3,76,8,175,32,27,148,32,73,148,
   224, 1446
290 DATA 5,240,2,56,96,165,255,201,1,208,2,24,96,162,5,76,
   1594
300 DATA 142,146,32,115,0,240,17,169,61,32,255,174,32,167,
   148,165, 1895
310 DATA 20,166,21,133,251,134,252,96,173,52,3,133,251,173,
   53,3, 1914
320 DATA 133,252,96,32,115,0,160,0,177,122,201,58,240,22,
   201,0, 1809
330 DATA 240,18,166,255,224,2,208,2,145,251,200,192,70,208,
   233,162, 2576
340 DATA 8,76,142,146,24,152,101,251,133,251,165,252,105,0,
   133,252, 2191
350 DATA 96,32,115,0,201,87,208,3,76,212,149,201,66,240,3,
   76, 1765
360 DATA 8,175,32,115,0,169,58,32,255,174,32,167,148,165,
   21,240, 1791
370 DATA 3,76,72,178,166,255,224,2,208,6,160,0,165,20,145,
   251, 1931
380 DATA 230,251,208,2,230,252,32,121,0,201,44,208,6,32,
   115,0, 1932
390 DATA 76,170,149,96,32,115,0,169,58,32,255,174,32,167,
   148,166, 1839
400 DATA 255,224,2,208,11,160,0,165,20,145,251,200,165,21,
   145,251, 2223
410 DATA 165,251,24,105,2,133,251,165,252,105,0,133,252,32,
   121,0, 1991
420 DATA 201,44,208,6,32,115,0,76,220,149,96,165,255,201,1,
   240, 2009
430 DATA 7,96,32,6,169,76,177,147,32,115,0,32,27,148,32,
   121, 1217
440 DATA 0,240,13,201,58,240,9,201,61,240,5,162,7,76,142,
   146, 1801
450 DATA 32,201,147,8,174,60,3,232,134,2,40,144,5,162,3,76,
   1423
460 DATA 142,146,165,253,24,105,9,133,65,165,254,105,0,133,
   66,205, 1970
470 DATA 200,147,144,11,138,205,199,147,144,5,162,2,76,142,
   146,160, 2028
480 DATA 0,185,60,3,145,253,200,196,2,208,246,32,121,0,160,
   7, 1818
490 DATA 201,61,240,22,234,234,234,234,165,251,145,253,200,
   165,252,145, 3036
500 DATA 253,165,65,133,253,165,66,133,254,96,152,72,32,
   115,0,32, 1986
510 DATA 167,148,104,168,165,20,145,253,200,165,21,145,253,
   76,129,150, 2309
520 DATA 133,90,134,91,132,92,162,0,160,0,185,61,3,209,90,
   208, 1750
530 DATA 11,200,192,3,208,244,177,90,133,2,56,96,232,228,
   92,208, 2172
540 DATA 2,24,96,24,169,4,101,90,133,90,165,91,105,0,133,
   91, 1318
550 DATA 76,168,150,32,27,148,173,60,3,201,3,240,5,162,1,
   76, 1525
560 DATA 142,146,169,253,162,144,160,8,32,160,150,144,3,
   169,1,96, 1939
570 DATA 169,29,162,145,160,25,32,160,150,144,3,169,2,96,
   169,129, 1744
580 DATA 162,145,160,23,32,160,150,144,3,169,3,96,76,221,
   150,177, 1871
590 DATA 69,201,255,240,3,133,2,96,162,4,76,142,146,169,
   143,32, 1873
600 DATA 255,174,201,42,208,12,165,255,208,2,230,255,32,66,
   149,76, 2330
610 DATA 116,151,72,165,255,208,5,162,8,76,142,146,104,201,
   93,208, 2112
620 DATA 1,96,201,33,208,3,76,116,151,201,46,208,6,32,11,
   150, 1539
630 DATA 76,116,151,201,36,208,6,32,99,149,76,116,151,201,
   35,208, 1861
640 DATA 6,32,145,149,76,116,151,32,19,177,176,5,162,1,76,
   142, 1465
650 DATA 146,32,233,151,32,18,150,32,121,0,201,0,240,7,201,
   58, 1622
660 DATA 240,9,76,8,175,32,165,147,76,29,151,32,115,0,76,
   34, 1365
670 DATA 151,169,0,133,255,32,82,147,165,95,141,167,2,165,
   96,141, 1941
680 DATA 168,2,32,253,174,201,73,240,9,201,83,240,15,162,8,
   76, 1937
690 DATA 142,146,173,197,147,174,198,147,133,253,134,254,
   32,115,0,208, 2453
700 DATA 236,32,94,147,32,190,147,32,29,151,230,255,173,
   167,2,133, 2050
710 DATA 95,173,168,2,133,96,32,190,147,32,29,151,165,251,
   141,52, 1857
720 DATA 3,165,252,141,53,3,76,115,147,32,211,150,201,2,
   208,5, 1764
730 DATA 169,1,76,2,152,201,1,208,6,32,48,152,76,2,152,32,
   1310
```

PROGRAM: PART3

```
10 CLR:S=38912
20 FOR LN=100 TO 730 STEP 10:T=0
30 FOR V=1 TO 16:READ A:T=T+A
40 POKE S,A:S=S+1:NEXT
50 READ T1:IF T<>T1 THEN PRINT"[DOWN]DATA ERROR IN LINE";LN
   :END
60 NEXT
70 PRINT"[DOWN]NOW LOAD PART4"
80 END
100 DATA 136,152,133,92,166,255,224,2,208,24,160,0,165,2,
   145,251, 2115
110 DATA 200,196,92,240,13,165,20,145,251,200,196,92,240,4,
   165,21, 2240
120 DATA 145,251,24,165,92,101,251,133,251,165,252,105,0,
   133,252,96, 2416
130 DATA 165,255,201,2,240,3,169,2,96,165,2,133,38,169,32,
   32, 1704
140 DATA 255,174,32,167,148,165,21,208,3,76,120,152,165,
   251,24,105, 2066
150 DATA 2,133,90,165,252,105,0,133,91,165,20,56,229,90,
   133,20, 1684
160 DATA 165,21,229,91,240,9,201,255,240,21,162,6,76,142,
   146,165, 2169
170 DATA 20,201,128,144,3,76,106,152,165,38,133,2,169,2,96,
   165, 1600
180 DATA 20,201,128,144,229,76,120,152,165,2,133,69,169,
   144,133,70, 1955
190 DATA 169,32,32,255,174,201,65,208,19,32,115,0,32,35,
   147,176, 1692
200 DATA 8,160,0,32,15,151,169,1,96,76,8,175,201,35,208,23,
   1358
210 DATA 32,115,0,32,167,148,144,12,165,21,240,3,76,72,178,
   160, 1565
220 DATA 1,32,15,151,169,2,96,201,40,208,3,76,87,153,165,
   255, 1654
230 DATA 201,2,240,13,165,69,201,121,240,4,201,110,208,3,
   169,3, 1950
240 DATA 96,32,167,148,176,3,169,3,96,165,21,208,62,32,121,
   0, 1499
250 DATA 201,44,240,26,165,69,201,110,240,4,201,121,208,8,
   160,5, 2003
260 DATA 32,15,151,169,3,96,160,2,32,15,151,169,2,96,32,
   253, 1378
270 DATA 174,201,88,240,7,201,89,240,7,76,8,175,160,3,208,
   2, 1879
280 DATA 160,4,32,15,151,32,115,0,169,2,96,32,121,0,201,44,
   1174
290 DATA 240,8,160,5,32,15,151,169,3,96,32,253,174,201,88,
   240, 1867
300 DATA 7,201,89,240,7,76,8,175,160,6,208,2,160,7,32,15,
   1393
310 DATA 151,32,115,0,169,3,96,32,115,0,32,167,148,32,121,
   0, 1213
320 DATA 201,44,240,38,32,247,174,201,44,240,8,160,10,32,
   15,151, 1837
330 DATA 169,3,96,32,253,174,169,89,32,255,174,165,21,240,
   3,76, 1951
340 DATA 72,178,160,9,32,15,151,169,2,96,32,253,174,169,88,
   32, 1632
350 DATA 255,174,169,41,32,255,174,165,21,240,3,76,72,178,
   160,8, 2023
360 DATA 32,15,151,169,2,96,147,13,67,79,77,77,79,68,79,82,
   1233
370 DATA 69,32,54,52,32,66,65,83,73,67,47,65,83,83,69,77,
   1017
380 DATA 66,76,69,82,13,49,57,56,53,32,83,46,68,46,67,0,
   863
390 DATA 65,82,69,32,89,79,85,32,83,85,82,69,32,40,89,47,
   1060
400 DATA 78,41,32,0,82,69,77,32,139,227,131,164,199,154,
   113,155, 1693
410 DATA 165,155,134,174,162,11,189,232,153,157,0,3,202,16,
   247,96, 2096
420 DATA 32,244,153,169,0,162,144,133,51,133,55,134,52,134,
   56,165, 1817
430 DATA 43,164,44,32,8,164,32,59,154,169,166,160,153,32,
   30,171, 1581
440 DATA 173,197,147,174,198,147,133,253,134,254,169,152,
   160,228,32,30, 2581
450 DATA 171,169,0,133,255,32,48,228,76,157,227,169,6,162,
   15,141, 1989
460 DATA 32,208,141,134,2,142,33,208,96,65,83,83,69,77,66,
   76, 1515
470 DATA 197,82,69,206,65,76,73,78,197,67,83,214,67,76,196,
   68, 1814
480 DATA 69,204,77,69,82,71,197,67,79,76,79,85,210,76,79,
   77, 1597
490 DATA 69,205,72,73,77,69,205,79,76,196,67,76,211,67,79,
   76, 1697
500 DATA 196,84,89,80,69,32,65,84,168,83,69,212,72,79,77,
   197, 1656
510 DATA 68,73,83,203,67,65,212,68,73,210,69,88,69,195,0,
   145, 1688
520 DATA 151,98,156,164,157,193,156,235,156,253,155,19,157,
   49,157,78, 2334
530 DATA 157,133,157,224,155,159,157,0,154,85,158,126,158,
   156,157,197, 2333
540 DATA 158,16,159,16,159,209,159,32,124,165,230,122,208,
   2,230,123, 2112
550 DATA 166,122,160,4,132,15,189,0,2,16,7,48,64,240,62,
   232, 1459
560 DATA 208,244,201,32,240,55,133,8,201,34,240,89,36,15,
   112,45, 1893
570 DATA 201,63,208,4,169,153,208,37,201,48,144,4,201,60,
   144,29, 1874
580 DATA 132,113,160,0,240,100,136,134,122,202,200,232,189,
   0,2,56, 2018
590 DATA 249,73,154,240,245,201,128,208,51,5,11,164,113,
   232,200,153, 2427
600 DATA 251,1,185,251,1,240,57,56,233,58,240,4,201,73,208,
   2, 2061
610 DATA 133,15,56,233,85,240,3,76,214,154,133,8,189,0,2,
   240, 1781
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620 DATA 220,197,8,240,216,200,153,251,1,232,208,240,166,
   122,230,11, 2695
630 DATA 200,185,72,154,16,250,185,73,154,208,177,189,0,2,
   16,187, 2068
640 DATA 153,253,1,198,123,169,255,133,122,96,169,75,133,
   11,76,6, 1973
650 DATA 155,16,8,201,255,240,4,36,15,16,3,76,243,166,201,
   203, 1838
660 DATA 176,3,76,36,167,233,202,170,132,73,160,255,202,
   240,8,200, 2333
670 DATA 185,73,154,16,250,48,245,200,185,73,154,48,5,32,
   71,171, 1910
680 DATA 208,245,76,239,166,32,178,155,76,174,167,76,43,
   168,56,76, 2135
690 DATA 239,167,32,115,0,240,244,201,203,144,243,201,223,
   176,239,233, 2900
700 DATA 202,10,168,185,160,154,133,21,185,159,154,133,20,
   32,115,0, 1831
710 DATA 108,20,0,32,175,146,165,21,208,3,165,20,96,76,72,
   178, 1485
720 DATA 32,185,158,169,255,160,1,145,43,32,51,165,165,34,
   24,216, 1835
730 DATA 105,2,133,45,165,35,105,0,133,46,76,96,166,32,185,
   158, 1482
```

PROGRAM: PART4

```
10 CLR:S=39936
20 FOR LN=100 TO 730 STEP 10:T=0
30 FOR V=1 TO 16:READ A:T=T+A
40 POKE S,A:S=S+1:NEXT
50 READ T1:IF T<>T1 THEN PRINT"[DOWN]DATA ERROR IN LINE";LN
   :END
60 NEXT
70 PRINT"FINISHED.PRESS ANY KEY WHEN READY TO[SPC4]SAVE."
80 POKE 198,0:WAIT 198,1:POKE 198,0
90 POKE 43,0:POKE 44,144:POKE 45,255:POKE 46,159
   :SAVE"IBACODE64",8,1:SYS 64738
100 DATA 32,175,146,32,19,166,144,87,165,95,72,165,96,72,
   32,253, 1751
110 DATA 174,32,175,146,32,19,166,144,70,160,1,177,95,170,
   136,177, 1874
120 DATA 95,168,104,133,96,104,133,95,152,160,0,145,95,200,
   138,145, 1963
130 DATA 95,200,177,95,133,20,200,177,95,133,21,169,0,141,
   0,2, 1658
140 DATA 104,104,169,79,162,156,141,2,3,142,3,3,76,164,164,
   169, 1641
150 DATA 131,162,164,141,2,3,142,3,3,32,233,155,108,2,3,76,
   1360
160 DATA 227,168,32,185,158,32,121,0,240,20,32,175,146,165,
   20,133, 1854
170 DATA 63,165,21,133,64,32,253,174,32,175,146,76,138,156,
   169,10, 1807
180 DATA 162,0,133,63,133,20,134,64,134,21,165,43,166,44,
   133,90, 1505
190 DATA 134,91,160,1,177,90,208,1,96,160,3,165,64,145,90,
   136, 1721
200 DATA 165,63,145,90,136,177,90,170,136,177,90,133,90,
   134,91,165, 2052
210 DATA 63,24,101,20,133,63,165,64,101,21,133,64,144,212,
   76,72, 1456
220 DATA 178,32,212,225,32,253,174,32,175,146,165,20,72,
   165,21,72, 1974
230 DATA 32,253,174,32,175,146,230,20,208,2,230,21,166,20,
   164,21, 1894
240 DATA 104,133,21,104,133,20,169,20,76,95,225,169,0,133,
   10,32, 1444
250 DATA 212,225,32,121,0,208,7,169,1,133,185,76,4,157,32,
   253, 1815
260 DATA 174,32,175,146,165,10,166,20,164,21,32,213,255,
   176,1,96, 1846
270 DATA 76,249,224,165,45,56,233,2,72,165,46,233,0,72,169,
   0, 1807
280 DATA 133,10,32,212,225,104,168,104,170,165,10,32,117,
   225,76,233, 2016
290 DATA 155,32,211,155,201,16,176,19,72,32,253,174,32,211,
   155,201, 2095
300 DATA 16,176,8,141,33,208,104,141,32,208,96,76,72,178,
   32,185, 1706
310 DATA 158,32,113,157,208,24,32,175,146,169,0,168,145,20,
   165,20, 1732
320 DATA 24,105,1,133,43,165,21,105,0,133,44,76,68,166,76,
   116, 1276
330 DATA 164,169,13,32,210,255,169,208,160,153,32,30,171,
   32,228,255, 2281
340 DATA 240,251,201,89,96,32,113,157,208,228,32,175,146,
   165,20,133, 2286
350 DATA 55,133,51,165,21,133,56,133,52,76,99,166,169,19,
   44,169, 1541
360 DATA 147,76,210,255,32,121,0,240,25,32,175,146,165,20,
   133,63, 1840
370 DATA 165,21,133,64,32,121,0,240,17,32,253,174,32,211,
   155,76, 1726
380 DATA 206,157,169,10,133,63,169,0,133,64,169,10,133,20,
   165,20, 1621
390 DATA 141,167,2,169,221,162,157,141,2,3,142,3,3,173,2,2,
   1490
400 DATA 201,95,240,62,162,0,169,32,157,119,2,232,224,10,
   144,248, 2097
410 DATA 166,63,165,64,32,52,158,138,168,162,10,134,198,
   202,185,0, 1897
420 DATA 2,153,119,2,136,16,247,160,3,185,228,153,157,119,
   2,202, 1884
430 DATA 136,16,246,24,165,63,109,167,2,133,63,144,2,230,
   64,76, 1640
440 DATA 131,164,169,131,141,2,3,169,164,141,3,3,169,0,141,
   0, 1531
450 DATA 2,76,66,156,134,99,133,98,162,144,56,32,73,188,32,
   223, 1674
460 DATA 189,32,135,180,32,166,182,162,0,189,0,1,157,0,2,
   240, 1667
```

```
470 DATA 3,232,208,245,96,32,211,155,201,25,176,31,72,32,
   253,174, 2146
480 DATA 32,211,155,201,40,176,20,72,169,41,32,255,174,104,
   168,104, 1954
490 DATA 170,24,32,240,255,32,121,0,76,160,170,76,72,178,
   165,255, 2026
500 DATA 201,2,240,5,162,5,76,142,146,32,139,176,133,73,
   132,74, 1738
510 DATA 169,178,32,255,174,169,34,32,255,174,165,14,72,
   165,13,72, 1973
520 DATA 32,167,148,169,34,32,255,174,165,21,164,20,133,98,
   132,99, 1843
530 DATA 162,144,56,32,73,188,76,186,169,165,157,201,128,
   208,1,96, 2042
540 DATA 162,10,76,142,146,169,255,133,13,133,14,169,106,
   162,0,133, 1823
550 DATA 73,134,74,32,177,169,165,106,166,107,164,108,32,
   189,255,32, 1983
560 DATA 121,0,208,4,169,8,208,9,32,253,174,32,211,155,32,
   2, 1618
570 DATA 159,170,169,15,168,32,186,255,32,192,255,176,65,
   169,15,76, 2134
580 DATA 195,255,201,8,144,5,201,12,176,1,96,162,11,76,142,
   146, 1831
590 DATA 32,121,0,208,5,169,8,76,32,159,32,211,155,32,2,
   159, 1401
600 DATA 170,169,1,160,0,32,186,255,169,36,133,87,169,48,
   133,88, 1836
610 DATA 169,2,162,87,160,0,32,189,255,32,192,255,144,10,
   72,165, 1926
620 DATA 184,32,195,255,104,76,249,224,160,3,132,183,166,
   184,32,198, 2377
630 DATA 255,32,207,255,133,87,32,183,255,208,107,32,207,
   255,133,88, 2469
640 DATA 32,183,255,208,97,164,183,136,208,224,132,183,32,
   207,255,72, 2571
650 DATA 32,183,255,170,104,224,0,208,77,164,183,192,80,
   176,71,153, 2272
660 DATA 60,3,170,240,4,230,183,208,227,162,0,32,198,255,
   166,87, 2225
670 DATA 165,88,32,205,189,169,32,32,210,255,160,0,185,60,
   3,240, 2025
680 DATA 6,32,210,255,200,208,245,169,13,32,210,255,162,0,
   32,198, 2227
690 DATA 255,32,225,255,240,16,32,228,255,201,32,208,5,32,
   228,255, 2499
700 DATA 240,251,160,2,208,162,162,0,32,198,255,165,184,32,
   195,255, 2501
710 DATA 96,169,0,133,10,32,212,225,169,0,133,185,165,10,
   166,43, 1748
720 DATA 164,44,32,213,255,144,3,76,249,224,104,104,32,233,
   155,169, 2201
730 DATA 0,32,144,255,32,119,166,32,142,166,76,174,167,0,0,
   0, 1505
```

TOP DRAW

Our graphics whizz, Allen Webb gives some handy routines for scrolling and rolling the screen.

THIS MONTH I WANT TO touch on the well thrashed subject of scrolls. As you will be aware, scrolling is used as a basis for many of the arcade games available. Initially, games used character scrolls but with the hardware features of the C64, single pixel scrolls are possible.

When preparing this article, I had to make the choice between providing a versatile character scroll package or a less versatile character scroll. Since many readers will have interestes beyond the writing of arcade games, I will cover the former but with a view to covering pixel scrolls at a later date.

The loader listed here provides the facilities to perform horizontal scrolls and rolls. In part two, I will look at vertical movement. So what are scrolls and rolls. Well, both involve the movement of the contents of an area of screen. In the case of a scroll, the screen contents are lost as they scroll – to be replaced with new information. In this package, spaces are inserted.

Consider a scroll to the left. The screen area is moved to the left, the leftmost column of characters is lost. The screen area is simultaneously replenished by a column of spaces on the right. In the case of a roll, the column of characters leaving the area is put on the other side of the area giving continuous motion of the screen – just like a conveyor belt.

Both scrolls and rolls have their value. A scroll is most useful for the presentation of a stream of information which is longer than the screen area involved. This could be a piece of landscape in an arcade game or a long piece of text. A roll is suited to the repetitive movement of a short piece on information.

The commands to control the scrolls and rolls have the simple form:

SYS SA,TL,BL,FLAG1,FLAG2,NS

Where SA = 49152 for movement to the right and SA = 49155 for movement to the left.

TL specifies the top line of the area moved. The top of the screen is line 0. BL specifies the bottom line of the area moved. The bottom of the screen has a value of 24. The commands move the full width of the screen.

FLAG1 specifies the type of movement:

FLAG 1 = 0 for a scroll
FLAG1 = 1 for a roll

FLAG2 specifies the information moved: Bit 0 controls the characters and bit 1 controls the colours.
Hence:

FLAG2 = 1 moves the characters only
FLAG2 = 2 moves the colours only
FLAG2 = 3 moves both the colours and characters

NS specifies the number of characters moved each time the routine is called.

I mentioned earlier that scrolls place a space in the new column of the screen after moving the information. In the case of the colour scrolls, the colour in the new column is set to the current cursor colour.

I have provided the option to move both colours and characters since it is possible to achieve some interesting effects. Try, for example, moving the colours and characters in opposite directions.

Two demonstration listings are provided to give an idea how the routines are used. I hope you find them of value.

Program: Scroll loader

```
1 DATA 76,6,192,76,205,192,
  32,153,193,165,20,141,132,
  3,32,153,193,165,20,141
2 DATA 133,3,32,153,193,165,
  20,141,135,3,32,153,193,
  165,20,141,138,3,32,153
3 DATA 193,165,20,141,140,3,
  173,140,3,240,12,206,140,
  3,32,163,193,32,64,192
4 DATA 76,46,192,96,173,132,
  3,141,139,3,160,39,177,
  251,141,136,3,177,253,141
5 DATA 137,3,173,138,3,41,1,
  240,6,136,177,251,200,145,
  251,173,138,3,41,2,240
6 DATA 6,136,177,253,200,145,
  253,136,208,227,173,135,3,
  240,27,173,138,3,41
7 DATA 1,240,5,173,136,3,145,
  251,173,138,3,41,2,240,5,
  173,137,3,145,253,76
8 DATA 166,192,173,138,3,41,
  1,240,4,169,32,145,251,
  173,138,3,41,2,240,5,173
9 DATA 134,2,145,253,173,139,
  3,205,133,3,240,30,24,165,
  251,105,40,133,251,165
10 DATA 252,105,0,133,252,
  165,251,133,253,24,165,
  252,105,212,133,254,238,
  139
11 DATA 3,76,70,192,96,32,
  153,193,165,20,141,132,3,
  32,153,193,165,20,141,133
12 DATA 3,32,153,193,165,20,
  141,135,3,32,153,193,165,
  20,141,138,3,32,153,193
13 DATA 165,20,141,140,3,173,
  140,3,240,12,206,140,3,32,
  163,193,32,10,193,76
14 DATA 245,192,96,76,10,193,
  173,132,3,141,139,3,160,0,
  177,251,141,136,3,177
15 DATA 253,141,137,3,173,
  138,3,41,1,240,6,200,177,
  251,136,145,251,173,138
16 DATA 3,41,2,240,6,200,177,
  253,136,145,253,200,192,
  39,208,225,173,135,3,240
17 DATA 27,173,138,3,41,1,
  240,5,173,136,3,145,251,
  173,138,3,41,2,240,5,173
18 DATA 137,3,145,253,76,114,
  193,173,138,3,41,1,240,4,
  169,32,145,251,173,138
19 DATA 3,41,2,240,5,173,134,
  2,145,253,173,139,3,205,
  133,3,240,30,24,165,251
20 DATA 105,40,133,251,165,
  252,105,0,133,252,165,251,
  133,253,24,165,252,105
21 DATA 212,133,254,238,139,
  3,76,16,193,96,32,253,174,
  32,138,173,32,247,183
22 DATA 96,169,0,133,251,133,
  253,169,4,133,252,172,132,
  3,240,16,24,165,251
23 DATA 105,40,133,251,165,
  252,105,0,133,252,136,208,
  240,24,165,252,105,212
24 DATA 133,254,165,251,133,
  253,96,0
25 REM
26 REM**************************
  *************
27 REM* HORIZONTAL SCROLL/RO
  LL ROUTINES *
28 REM*[SPC12]AEW 1985[SPC13]
  *
29 REM**************************
  *************
30 FOR I = 49152 TO 49614
31 READ X: T = T + X
32 POKE I,X: NEXT I
33 IF T<>57701 THEN PRINT"ER
  ROR IN DATA"
```

Program: Demo 1

```
10 REM************************
   ******
20 REM* HORIZONTAL SCROLL
   DEMO 1 *
30 REM************************
   ******
40 REM
50 POKE 53280,8:POKE 53281,9
   :NS=1
60 S$="[BLACK]++[C4]**[C5,
   SQ2,C8]**[WHITE]++"
70 O$=S$+S$+S$+S$
80 P$="---------------------
   -------------------"
90 SA=12*4096:GOSUB 120
100 SA=12*4096+3:GOSUB 120
110 GOTO 110
120 FOR Y=0 TO 23 STEP 2
   :GOSUB 400:PRINT O$:NEXT
130 FOR Y=1 TO 22 STEP 2
   :GOSUB 400:PRINT P$:NEXT
140 X=8:Y=24:GOSUB 400
   :PRINT"CHARACTER & COLOUR
   ROLL"
150 FOR J=1 TO 60
160 SYS SA,0,21,1,3,NS
170 FOR D=1 TO 130:NEXT
180 NEXT
190 X=8:Y=22:GOSUB 400
   :PRINT"[SPC5]COLOUR ROLL
   [SPC9]"
200 FOR J=1 TO 30
210 SYS SA,0,21,1,2,NS
220 FOR D=1 TO 130:NEXT
230 NEXT
240 X=8:Y=22:GOSUB 400
   :PRINT"[SPC4]CHARACTER
   ROLL[SPC4]"
250 FOR J=1 TO 30
260 SYS SA,0,21,1,1,NS
270 FOR D=1 TO 130:NEXT
280 NEXT
290 X=0:Y=22:GOSUB 400
   :PRINT"COLOUR SCROLL LEAV
   ING THE CURSOR COLOUR"
300 FOR J=1 TO 40
310 SYS SA,0,21,0,2,NS
320 FOR D=1 TO 30:NEXT
330 NEXT
340 X=0:Y=22:GOSUB 400
   :PRINT"[SPC12]CHARACTER
   SCROLL[SPC11]"
350 FOR J=1 TO 40
360 SYS SA,0,21,0,1,NS
370 FOR D=1 TO 30:NEXT
380 NEXT
390 RETURN
400 POKE 781,Y:POKE 782,X
   :POKE 783,0:SYS 65520
   :RETURN
```

Program: Demo 2

```
10 REM************************
   ******
20 REM* HORIZONTAL SCROLL
   DEMO 2 *
30 REM************************
   ******
40 REM
50 PRINT"[CLEAR]"
60 O$="[SQ40]"
70 POKE 53280,0:POKE 53281,0
80 FOR Y=0 TO 6:GOSUB 240
   :PRINT O$:NEXT
90 FOR I=0 TO 280
   :POKE 55296+I,RND(1)*15+1
   :NEXT
100 FOR NS=1 TO 20
   :FOR J=1 TO 10
   :  SYS 12*4096+3,0,3,1,2,
   NS
110 SYS 12*4096,3,6,1,2,NS
   :NEXT J,NS
120 O$="ABCDEFGHIJKLMNOPQRST
   UVWXYZ0123456789+-*="
130 PRINT"[CLEAR]"
140 FOR Y=0 TO 5:GOSUB 240
   :PRINT O$:NEXT
150 FOR I=0 TO 240
   :POKE 55296+I,I+1:NEXT
160 FOR I=1 TO 3
170 SYS 12*4096,0,5,1,3,100:
180 SYS 12*4096+3,2,3,1,3,100
   :
190 NEXT
200 FOR I=1 TO 3:SYS 12*4096
   +3,2,3,1,1,255:NEXT
210 FOR I=1 TO 39
   :SYS 12*4096,2,3,0,3,1
   :NEXT
220 SYS 12*4096+3,2,3,1,3,10
   :GOTO 220
230 END
240 POKE 781,Y:POKE 782,X
   :POKE 783,0:SYS 65520
   :RETURN
```

CORRECTION

High-Res Aid

A number of people noticed the absence of the demonstration program from the Top Draw feature in the January issue of Your Commodore.

Sorry, the listing did get missed, so it is printed here for all those who are waiting to see just what this superb package can do.

PROGRAM: High-Res Demo

```
10 REM********
20 REM* DEMO *
30 REM********
35 POKE 56,128:CLR: REM PROTECT SPRITES ETC
40 REM SHAPE DATA
50 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,8,22,33,
   0,0,0,0,0,0,0,0,0
60 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,14,17,56,56,56,
   0,0,0,0,0,128,96
70 DATA 16,0,0,0,0,4,10,17,24,0,0,0,0,0,3,7,199,33,48,120,
   248,252,254,243,225
80 DATA 0,128,128,192,112,8,4,4,0,0,0,0,56,116,114,251,0,0,
   0,1,3,3,7,7,60,60
90 DATA 127,253,248,248,248,252,16,16,8,8,136,132,4,2,28,
   60,124,248,248,252
100 DATA 252,254,79,47,63,31,15,7,7,7,225,224,240,248,252,
   252,248,252,2,3,3,3
110 DATA 15,31,31,63,248,252,252,252,248,224,192,192,143,
   79,47,63,63,31,15,7
120 DATA 252,252,254,250,249,248,240,240,6,13,9,16,16,0,7,
   7,0,0,21,26,36,9,33
130 DATA 6,146,72,34,232,148,104,201,34,0,128,32,0,144,224,
   8,160,52,11,36,9,4
140 DATA 0,0,0,172,44,165,100,40,40,40,110,128,32,0,0,0,0,
   0,0,0,0,0,0,0,0,0
150 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
```

```
   12,12,28,28,46,93
160 DATA 46,77,0,0,0,0,0,0,0,0,0,1,1,0,1,3,0,188,78,157,
   46,205,60,78,189,128
170 DATA 0,128,192,32,192,32,192,5,1,2,1,2,3,4,0,223,44,
   222,109,140,12,20,34
180 DATA 32,208,32,16,192,32,0,0,3,3,3,3,3,3,2,199,68,
   124,0,0,128,49,123,227
190 DATA 34,62,0,0,0,140,222,192,64,64,64,64,64,64,0,0,
   0,0,0,0,0,0,107
200 DATA 202,192,224,224,224,225,225,90,83,1,1,1,1,129,129,
   128,0,0,0,0,0,0,0
210 DATA 0,0,0,0,0,0,0,0,225,225,240,240,240,240,241,225,
   129,129,1,1,1,1,129
220 DATA 129,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,225,225,240,
   240,240,240,240,240
230 DATA 129,129,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
   0,240,240,225,227
240 DATA 227,227,227,227,1,1,129,193,193,193,193,193,0,0,0,
   0,0,0,0,0,0,0,12
250 DATA 26,12,0,0,0,0,28,50,26,12,0,0,0,4,26,57,57,29,
   14,0,0,0,1,3,1,0,14
260 DATA 57,56,196,128,129,195,227,129,128,0,0,224,145,3,4,
   128,64,0,0,0,128
270 DATA 192,32,32,64,112,240,248,126,63,0,0,0,71,28,56,60,
   31,0,0,0,0,0,0,0
280 DATA 255,0,0,0,16,16,48,96,192,0,0,0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,255
290 DATA 255,255,255,255,255,255,255,192
300 FOR I =50700 TO 51308
310 READ X: T=T+X
320 POKE I,X
330 NEXT
340 IF T<>37916 THEN PRINT"DATA ERROR"
350 SA=12*4096: CT=50700: REM SHAPE TABLE STARTS AT 50700
360 REM CLEAR SCREEN WHITE PAPER BLACK INK
370 REM LOWER CASE CHARACTERS DISABLE PAINT
380 SYS SA,0,1: SYS SA+24,55296:SYS SA+27,0
390 REM DRAW MOUNTAINS
400 FOR X=0 TO 32 STEP 8
410 SYS SA+33,CT,X,3,8,3,1,0: NEXT
420 REM USE AIR BRUSH TO SHADE GROUND
430 FOR X = 0 TO 316 STEP 16
440 SYS SA+18,X,48,1,10,0: NEXT
450 FOR X = 0 TO 316 STEP 32
460 SYS SA+18,X,64,1,10,1: NEXT
470 FOR X = 0 TO 316 STEP 32
480 SYS SA+18,X,96,1,5,1: NEXT
490 FOR X = 0 TO 316 STEP 32
500 SYS SA+18,X,128,1,3,1: NEXT
510 FOR X = 0 TO 316 STEP 32
520 SYS SA+18,X,160,1,2,1: NEXT
530 REM DRAW WOOD
540 Y=6:FOR X=0 TO 15 STEP 2
550 GOSUB 920:NEXT
560 Y=Y+2: FOR X=1 TO 13 STEP 2
570 GOSUB 920:NEXT
580 REM DRAW TOWER AND TIDY UP MOUNTAINS
590 SYS SA+33,CT+42*8,36,2,4,5,0,0
600 SYS SA+33,CT+16*8,36,5,1,1,0,0:SYS SA+33,CT+16*8,39,5,
   1,1,0,0
610 REM DRAW ROCKS
620 FOR I=1 TO 15:SYS SA+33,CT+64*8,RND(1)*40,RND(1)*5+14,
   1,1,2,0:NEXT
630 FOR I=1 TO 15:SYS SA+33,CT+63*8,RND(1)*40,RND(1)*5+9,1,
   1,2,0:NEXT
640 FOR I=1 TO 15:SYS SA+33,CT+62*8,RND(1)*40,RND(1)*5+6,1,
   1,2,0:NEXT
650 REM ENABLE PAINT AND PAINT BACKGROUND
660 SYS SA+15,0,11:PRINT"[CLEAR]":SYS SA+27,1
670 FOR LN=6 TO 8:GOSUB 950:NEXT
680 SYS SA+15,0,12
690 FOR LN=9 TO 13:GOSUB 950:NEXT
700 SYS SA+15,0,15
710 FOR LN=14 TO 20:GOSUB 950:NEXT
720 SYS SA+15,0,1
730 SYS SA+12,37*8,48,3: SYS SA+12,38*8,48,3
740 REM DRAW CLOUDS AND PRINT TEXT
750 SYS SA+33,CT+65*8,10,1,4,2,1,0
760 SYS SA+15,6,14
770 PRINT"[CLEAR,SW]E STAND TO THE SOUTH OF A ROCKY PLAIN."
   : SYS SA+30,20,0,0
780 PRINT"[CLEAR,ST]O THE NORTH ARE DARK MOUNTAINS.[SPC,ST]
   O THE": SYS SA+30,21,0,0
790 PRINT"[CLEAR]NORTHWEST IS A WOOD.[SPC,ST]O THE NORTH
    EAST ": SYS SA+30,22,0,0
800 PRINT"[CLEAR]IS AN ANCIENT TOWER.[SPC,SS]OME SOLDIERS
    ARE ": SYS SA+30,23,0,0
810 PRINT"[CLEAR]BLOCKING THE ROUTE TO THE TOWER. "
   : SYS SA+30,24,0,0
820 REM POSITION SPRITES
830 DATA 0,252,12,3,255,60,3,119,60,3,119,44,3,87,44,0,84,
   32,3,255,32,15,255
840 DATA 224,5,127,224,5,127,224,5,127,224,5,106,224,5,106,
   224,5,106,224,5,106
850 DATA 32,1,170,32,2,170,32,3,3,32,3,3,32,15,3,192,63,3,
   240,22,85
860 FOR I=0 TO 62:READ X:POKE 33600+I,X:NEXT
870 FOR I=0 TO 7:POKE 36856+I,13:POKE 53287+I,9:NEXT:Z=0
   :Y=0
880 POKE 53269,255
890 FOR I=53248 TO 53256 STEP 2:POKE I,Z:POKE I+1,110
   :Z=Z+18:NEXT:POKE 53264,255
900 FOR I=53258 TO 53262 STEP 2:POKE I,Y:POKE I+1,140
   :Y=Y+24:NEXT:POKE 53271,224
910 POKE 53277,0  :POKE 53276,255:POKE 53285,8
   :POKE 53286,0:END
920 RN=RND(1)
930 IF RN<.5 THEN SYS SA+33,CT+33*8,X,Y-1,3,3,2,0:RETURN
940 SYS SA+33,CT+24*8,X,Y,3,2,2,0:RETURN
950 SYS SA+30,LN,2,0:RETURN
```

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Brighten up your disk directories with this handy utility from RJ Miller

RAINBOW DISK

Variable Details			
C	– colour choice	CS$	– clear screen
D	– divider choice	CU$	– cursor up
I,J	– counters	D$(1-6)	– divider array
MA	– match flag	E$(0-3)	– disk error messages
A$	– keyboard press	FL$	– filename
C$(1-4)	– colour array	MA$	– match string
CD$	– cursor down	RV$	– reverse on
		WH$	– white print
		X$	– disk read

HAVE YOU EVER WISHED that you could make your disk directories look a little more interesting? Would you like them to give you a little more information? Now they can.

Rainbow Disk allows you to split the disk directory into a number of different coloured sections.

Now you may have the games on your disk highlighted in red, your utilities could be green and you could have a blue section for data files.

Rainbow Disk is a Basic program and you should have no problems typing it in. However do make sure that you save it before attempting to RUN it.

Pretty Colours

Rainbow Disk is very easy to use. You should first design a section divider by following the on screen prompts, you can even put in your own messages. Then when this divider is stored on to disk all files that appear below it will appear in the new colour until a new divider is reached.

Rainbow Disk is an extremely good addition to the Disk Orderly program by Les Allan featured in the October 1985 issue of Your Commodore. Simply append a range of coloured dividers to the end of the disk and then use Disk Orderly to sort all of the files into the order that you require.

Program Details

10 - 60 set up variables
70 - 250 display instructions
260 - 360 choose a divider
370 - 400 choose a colour
410 - 490 confirm choice
500 - 510 save choice to disk
520 - 550 erasing a divider
560 - 610 final options menu
620 - 650 display directory
660 - 680 get key subroutine
690 - 700 read error channel

PROGRAM: RAINBOW DISK

```
1 REM **********************
  ***********
2 REM *** RAINBOW DISK UTILI
  TY V1.0 ***
3 REM *** R J MILLER[SPC2]--
  [SPC2]SEPT 1985 ***
4 REM **********************
  ***********
5 REM ***[SPC2]SET UP SCREEN
  & STRINGS[SPC2]***
6 REM **********************
  ***********
10 POKE 53281,0:RV$=CHR$(18)
  :CD$=CHR$(17):CU$=CHR$(14
  5):CS$=CHR$(147)
  :WH$=CHR$(5)
20 FOR I=1 TO 5:READ D
  :FOR J=0 TO 13
  :D$(I)=D$(I)+CHR$(D)
  :NEXT J,I
30 DATA 45,95,43,35,32
40 D$(5)=RV$+D$(5)
50 FOR I=1 TO 4:READ C
  :C$(I)=CHR$(C):NEXT
60 DATA 5,28,30,31
67 REM **********************
  ***********
68 REM ***[SPC7]INSTRUCTIONS
  [SPC7]***
69 REM **********************
  ***********
70 PRINT CS$CD$WH$RV$" RAINB
  OW DISK[SPC2]-[SPC2]R J
  MILLER[SPC2]SEPT 1985
  "
80 FOR I=55337 TO 55348
  :READ C:POKE I,C:NEXT
90 DATA 7,3,4,5,7,8,4,7,10,
  12,13,14
100 PRINT" CREATE COLOURFUL
  DISK DIRECTORIES WITH"
110 PRINT" THIS USEFUL UTILI
  TY."CD$
120 PRINT" CHOOSE A SUITABLE
  DIVIDER AND COLOUR -"
130 PRINT" ALL FILES LOWER
  ON THE[SPC2]DISK DIRECTO
  RY"
140 PRINT" WILL BE DISPLAYED
  ON THE SCREEN IN THE"
150 PRINT" NEW COLOUR !"CD$
160 PRINT" WITH A BIT OF PLA
  NNING, YOU CAN CREATE"
170 PRINT" A MULTICOLOUR DIR
  ECTORY TO HIGHLIGHT A"
180 PRINT" PARTICULAR SET
  OF FILES."CD$
190 PRINT" FOUR COLOURS ARE
  AVAILABLE :"CD$
200 FOR I=1 TO 4:PRINT SPC(3
  )RV$C$(I)LEFT$(D$(5),7);
  :NEXT:PRINT WH$
210 PRINT CD$" REMEMBER THAT
  SOME COLOUR COMBINATIONS"
220 PRINT" MAY NOT SHOW UP
  WELL EG. BLUE PRINT ON"
230 PRINT" A BLUE SCREEN OR
  EVEN RED ON BLUE."CD$
240 PRINT CD$"[SPC3]
  *** PRESS ANY KEY TO CONT
  INUE ***";
250 GET A$:IF A$=""THEN 250
257 REM *********************
  ***********
258 REM *** CHOOSE STYLE OF
  DIVIDER ***
259 REM *********************
  ***********
260 PRINT CS$CD$RV$TAB(8)"EN
  TER CHOICE OF DIVIDER"CD$
  :D$(6)=RV$+"-YOUR MESSAGE
  -"
270 FOR I=1 TO 6:PRINT TAB(8
  )I")"SPC(4)D$(I)CD$:NEXT
280 PRINT CD$RV$TAB(8)"[SPC2]
  PRESS KEY TO CHOOSE[SPC2]
  "CD$
290 PRINT" REMEMBER
  : A DIVIDER/COLOUR COMBIN
  ATION"
300 PRINT" CAN ONLY BE USED
  ONCE ON A DISK.[SPC2]
  WITH"
310 PRINT" THE[SPC2]MESSAGE
  OPTION TOO, HOWEVER,
  THIS"
320 PRINT" SHOULD NOT CREATE
  MUCH OF A PROBLEM!"
330 MA$="123456":GOSUB 660
  :D=VAL(A$)
340 IF D<>6 THEN 370
350 PRINT CD$" ENTER MESSAGE
  (13CHRS) "RV$"[SPC14]"CU$
360 PRINT TAB(23);
  :INPUT D$(6):D$(6)=RV$+D$
  (6)
367 REM *********************
  ***********
368 REM *** CHOOSE ONE OF
  4 COLOURS ***
369 REM *********************
  ***********
370 PRINT CS$CD$RV$TAB(8)"EN
  TER CHOICE OF COLOUR:"CD$
380 FOR I=1 TO 4:PRINT TAB(8
  )I")"SPC(3)C$(I)D$(5)WH$C
  D$:NEXT
```

```
390 PRINT RV$TAB(8)"[SPC2]
   PRESS KEY TO CHOOSE[SPC2]
   "CD$CD$
400 MA$="1234":GOSUB 660
   :C=VAL(A$)
407 REM ********************
   ***********
408 REM *** CHECK THAT CHOIC
   E IS OK ***
409 REM ********************
   ***********
410 PRINT"[SPC3]YOUR CHOICE
   IS :"CD$
420 PRINT"[SPC3]DIVIDER[SPC9]
   "D$(D)CD$
430 PRINT"[SPC3]COLOUR[SPC10]
   "C$(C)D$(5)CD$
440 PRINT CD$WH$TAB(14)"OK
   ?[SPC3](Y/N)"
450 MA$="YN":GOSUB 660
   :IF A$="N"THEN 260
460 PRINT CS$CD$"[SPC2]READY
   TO SAVE YOUR CHOICE TO
   DISK :[SPC3]"CD$
470 PRINT TAB(13)C$(C)D$(D)C
   D$CD$
480 PRINT WH$"[SPC2]PRESS
   [P] TO PROCEED OR [A]
   TO ABORT[SPC2]"CD$
490 MA$="PA":GOSUB 660
   :IF A$="A"THEN 560
497 REM ********************
   ***********
498 REM ***OPEN USR FILE WIT
   H CHOICE***
499 REM ********************
   ***********
500 FL$=CHR$(34)+C$(C)+D$(D)
   +",U,W"
510 OPEN 15,8,15:OPEN 2,8,2,
   FL$:CLOSE 2:GOSUB 690
517 REM ********************
   ***********
518 REM *** HOW TO ERASE A
   DIVIDER! ***
519 REM ********************
   ***********
520 PRINT CD$CD$" IF YOU WIS
   H TO[SPC2]SCRATCH[SPC2]
   THIS DIVIDER,"
530 PRINT" YOU CAN DO SO BY
   CHOOSING [E] BELOW OR"
540 PRINT" ENTERING THE FOLL
   OWING IN DIRECT MODE:"CD$
550 PRINT"OPEN15,8,15,
   "CHR$(34)"S0:?"C$(C)D$(D)
   CHR$(34)":CLOSE15"
560 PRINT CD$CD$WH$" ** PRES
   S [R] TO RE-RUN, [Q] TO
   QUIT **"
570 PRINT" **[SPC2][D] FOR
   DIRECTORY, [E] TO ERASE
   ** ";
580 MA$="RQDE":GOSUB 680
   :IF A$="R"THEN RUN
590 IF A$="D"THEN 620
600 IF A$="E"THEN OPEN 15,8,
   15,"S0:?"+C$(C)+D$(D)
   :GOSUB 690:GOTO 560
610 POKE 646,14:PRINT CS$CD$
   " GOODBYE !";:END
617 REM ********************
   ***********
618 REM *** DISPLAY DISK DIR
   ECTORY[SPC2]***
619 REM ********************
   ***********
620 POKE 646,14:PRINT CD$
   :OPEN 1,8,0,"$"
   :GET#1,X$,X$
630 GET#1,X$,X$,X$,X$
   :IF ST THEN CLOSE 1
   :GOTO 560
640 GET#1,X$:IF X$=""THEN PR
   INT:GOTO 630
650 PRINT X$;:GOTO 640
657 REM ********************
   ***********
658 REM *** GET REQUIRED KEY
   INPUT[SPC2]***
659 REM ********************
   ***********
660 GET A$:FOR I=1 TO LEN(MA
   $):IF A$=MID$(MA$,I,
   1)THEN MA=1
670 NEXT:IF MA THEN MA=0
   :RETURN
680 GOTO 660
687 REM ********************
   ***********
688 REM *** CHECK DISK ERROR
   CHANNEL***
689 REM ********************
   ***********
690 PRINT CD$" ERROR REPORT
   :";:INPUT#15,E$(0),E$(1),
   E$(2),E$(3)
700 FOR I=0 TO 3:PRINT" "E$(
   I);:NEXT:CLOSE 15:PRINT
   :RETURN
```



Your powers of deduction are tested to the full by this program from D Waldron.

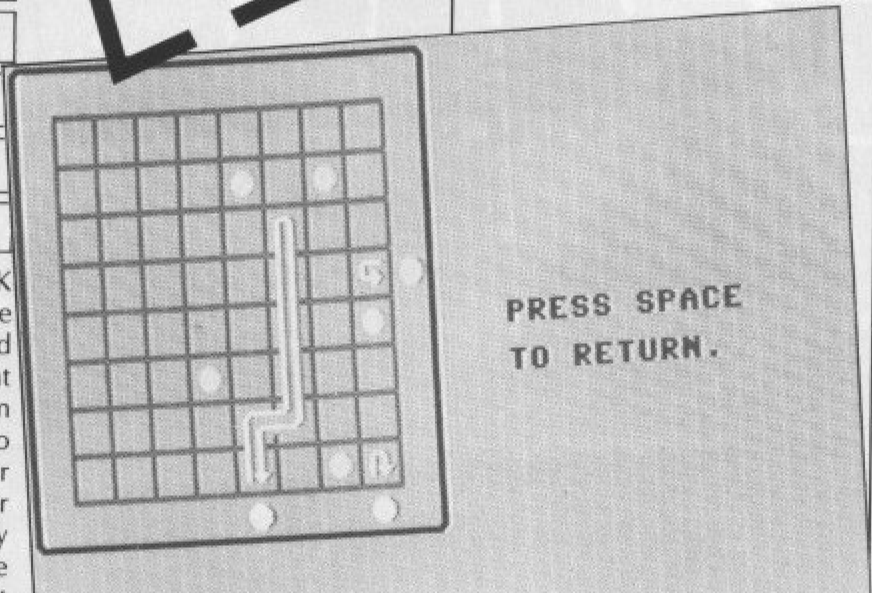
YOU HAVE BEEN SET THE TASK of finding five mines that the evil Seepeayu has planted within a grid. Your equipment consists of an electron beam emitter which can be fired into the grid. The mines affect your beam depending on how near to them the ray passes. Your ray may pass straight through the grid, it may be absorbed, it could even be reflected back on itself. You have to decide where the five mines are by studying what happens to your rays.

In this game the idea is to score as few points as possible. You are awarded points for each ray that you shoot and each mine that you guess incorrectly.

Full instructions are included in the program.

No problems should be encountered when entering the program but do make sure that you read the LISTINGS page to be found elsewhere in this issue so that you understand what all the mnemonics mean.

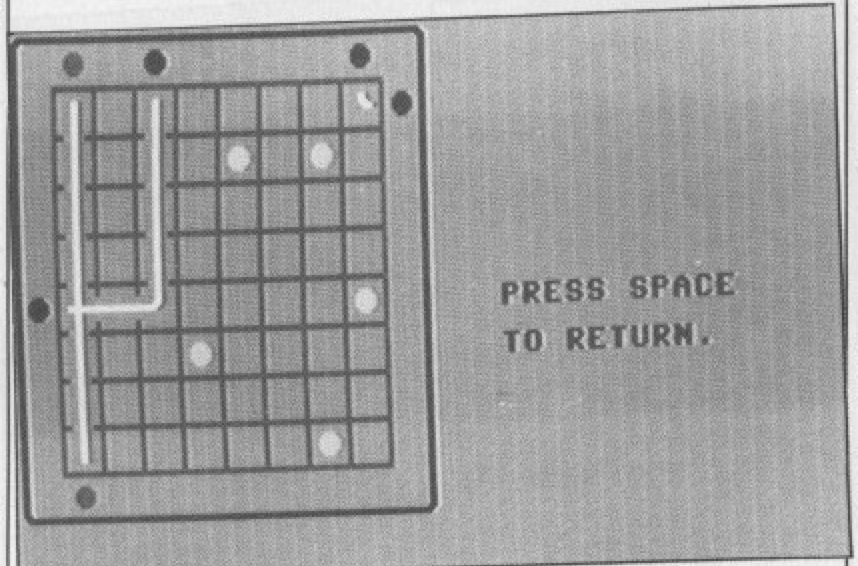
Don't forget to SAVE all the program on tape or disk before you attempt to RUN it.



PROGRAM: GRID.LIST

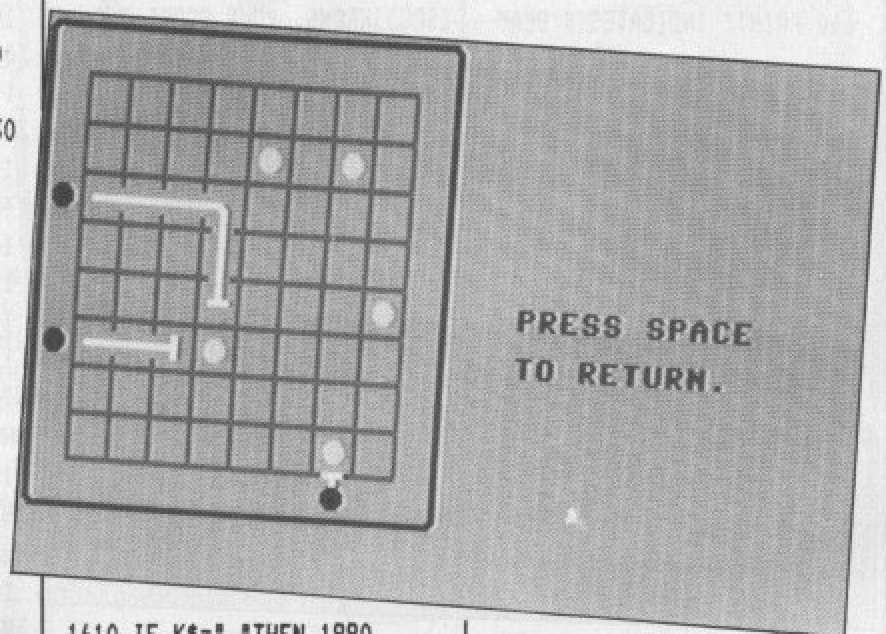
```
 10 REM************************
************
 20 REM*[SPC32]*
 30 REM*[SPC11]GRIDSEARCH
[SPC11]*
 40 REM*[SPC32]*
 50 REM*[SPC8]BY DEREK WALDRO
N[SPC8]*
 60 REM*[SPC32]*
 70 REM*[SPC10]JANUARY 1985
[SPC10]*
 80 REM*[SPC32]*
 90 REM************************
************
 100 :
 110 POKE 54296,15
:POKE 54277,255:POKE 54278,19
:H1=54273:L1=54272:W1=54276
 120 H2=54280:L2=54279
:W2=54283:POKE 54284,51
:POKE 54285,19
 130 W3=54290:H3=54287
:L3=54286:POKE 54291,31
:POKE 54292,55
 140 FL=216
 150 PRINT"[CLEAR]";
:POKE 53281,15:POKE 53280,12
 160 GOSUB 2730:GOSUB 3170
:HS=0:IT=0:SU=0:CO=20480
 170 DIM SC(10,10),G%(10,10),
GP%(10,10)
 180 PRINT"[DOWN5]";
 190 POKE 52,128:POKE 56,128
:PRINT CHR$(142)
 200 REM INITIALISE GRID
 210 AD=34776:FOR Y=10 TO 1 S
TEP-1:AD=AD+80:A1=AD
 220 FOR X=1 TO 10:IT=IT+1
:SC(X,Y)=A1+1:A1=A1+2
 230 PRINT:PRINT SPC(3)"
[WHITE]DATA TO TRANSFER :";
:PRINT 1196-IT"[LEFT,SPC,UP2]"
:NEXT X,Y
 240 REM TRANSFER CHARACTER
 ROM TO RAM
 250 POKE 56334,PEEK(56334)AN
D 254:POKE 1,PEEK(1)AND 251
 260 FOR I=0 TO 1015
:POKE I+32768,PEEK(I+53248)
:IT=IT+1
 270 PRINT:PRINT SPC(3)"
[WHITE]DATA TO TRANSFER :";
:PRINT 1196-IT"[LEFT,SPC,UP2]"
:NEXT
 280 POKE 1,PEEK(1)OR 4
:POKE 56334,PEEK(56334)OR 1
 290 FOR I=FL TO FL+39:READ DA
:POKE 32768+I,DA:SU=SU+DA
:IT=IT+1
 300 PRINT:PRINT SPC(3)"
[WHITE]DATA TO TRANSFER :";
:PRINT 1196-IT"[LEFT,SPC,UP2]"
:NEXT
 310 IF FL=216 THEN FL=280
:GOTO 290
 320 REM DATA ERROR TRAP
 330 IF IT<>1196 THEN PRINT"E
RROR IN NUMBER OF DATA ITEMS."
```

```
:STOP
 340 IF SU<>8898 THEN PRINT"E
RROR IN DATA.":STOP
 350 PRINT:PRINT SPC(3)"DO
 YOU REQUIRE INSTRUCTIONS (Y/
N)"
 360 GET K$:IF K$=""THEN 360
 370 IF K$="N"THEN 900
 380 IF K$<>"Y"THEN 360
 390 PRINT"[CLEAR]";
 400 PRINT"[GREEN,RIGHT6,
RVSON,SPC]GRIDSEARCH INSTRUCT
IONS[SPC,RVSOFF]"
 410 PRINT"[BLUE,DOWN,SPC]IT
 IS YOUR TASK AS GRIDSEARCHER
 TO[SPC6]FIND OUT WHERE IN
 THE ";
 420 PRINT"GRID THE EVIL[SPC5]
SEEPEAYU HAS PLACED 5 MINES."
 430 PRINT:PRINT" IT IS KNOWN
 THAT THE MINES EMIT A[SPC7]
STRONG MAGNETIC FORCE."
 440 PRINT:PRINT" YOU HAVE
 BEEN EQUIPPED WITH A NEURAL
[SPC4]ELECTRON BEAM EMITTER.";
 450 PRINT" THE RAYS FROM
[SPC4]THIS DEVICE WILL BE AFF
ECTED BY THE[SPC4]";
 460 PRINT" MAGNETIC FIELDS
 OF THE MINES IN A PRE-[SPC2]
DETERMINED WAY, WHICH WILL";
 470 PRINT" ALLOW YOU[SPC4]TO
 PINPOINT EACH OF THE MINES
 IN THE[SPC4]GRID."
 480 PRINT"[YELLOW,DOWN,SPC7,
RVSON]PRESS SPACE WHEN READY
[RVSOFF]"
 490 GET K$:IF K$<>" "THEN 490
 500 PRINT"[CLEAR,GREEN,
RIGHT6,RVSON,SPC]GRIDSEARCH
 INSTRUCTIONS[SPC,RVSOFF]"
 510 PRINT"[BLUE,DOWN,SPC]IF
 A MINE IS ADJACENT TO THE
 PATH OF[SPC4]YOUR BEAM, THE
 RAYS WILL BE";
 520 PRINT" DEFLECTED[SPC3]90
 DEGREES AWAY FROM THE MINE."
 530 PRINT:PRINT" IF THE PATH
 OF YOUR BEAM LIES BETWEEN
[SPC3]TWO MINES, EACH WILL";
 540 PRINT" DEFLECT THE BEAM
[SPC3]EQUALLY, SENDING IT BAC
K THE WAY IT[SPC5]CAME."
 550 PRINT:PRINT" IF A MINE
 LIES DIRECTLY IN THE PATH
 OF[SPC2]A BEAM, THE BEAM WIL
L";
 560 PRINT" BE ABSORBED."
 570 PRINT:PRINT" THE ONLY
 PECULIARITY IS WHEN A BEAM
[SPC5]TRIES TO ENTER THE GRID
";
 580 PRINT" ON A SQUARE[SPC5]
NEXT TO ONE THAT IS MINED.
 THIS RESULTS IN THE BEAM";
 590 PRINT" BEING SENT STRAIG
HT BACK[SPC4]OUT OF THE GRID."
 600 PRINT"[YELLOW,DOWN,SPC7,
RVSON]PRESS SPACE WHEN READY
[RVSOFF]"
 610 GET K$:IF K$<>" "THEN 610
 620 PRINT"[CLEAR,GREEN,
RIGHT6,RVSON,SPC]GRIDSEARCH
 INSTRUCTIONS[SPC,RVSOFF]"
 630 PRINT"[BLUE,DOWN,SPC]THE
 BEAMS ARE INVISIBLE; ALL YOU
 KNOW"
 640 PRINT" IS WHERE THEY ENT
ER THE GRID, AND"
 650 PRINT" WHERE THEY COME
 OUT.":PRINT"[DOWN,SPC]
A WHITE MARK";
 660 PRINT" INDICATES A BEAM
THAT GOES IN AND";
 670 PRINT" COMES OUT AT THE
 SAME PLACE."
 680 PRINT:PRINT" A BLACK MAR
K INDICATES A BEAM THAT"
 690 PRINT" ENTERS THE GRID,
 BUT DOES NOT COME OUT.";
 700 PRINT:PRINT" THE COLOURE
D MARKS INDICATE ENTRY AND"
 710 PRINT" EXIT POINTS FOR
 BEAMS THAT GET THROUGH"
 720 PRINT" THE GRID. (THE
 COLOURS ARE MATCHED,"
 730 PRINT" AND RAYS ARE REVE
RSIBLE. I.E. SEND A"
 740 PRINT" RAY INTO THE GRID
 AT AN EXIT POINT AND"
 750 PRINT" IT WILL COME OUT
 AT THE ORIGINAL ENTRY"
 760 PRINT" POINT).
 770 PRINT"[YELLOW,DOWN,SPC7,
RVSON]PRESS SPACE WHEN READY
[RVSOFF]"
 780 GET K$:IF K$<>" "THEN 780
 790 PRINT"[CLEAR,GREEN,
RIGHT6,RVSON,SPC]GRIDSEARCH
 INSTRUCTIONS[SPC,RVSOFF]"
 800 PRINT:PRINT"[WHITE,SPC]A
 VISUAL REMINDER OF THESE POI
NTS IS[SPC4]AVAILABLE WHEN
 PLAYING";
 810 PRINT" BY USING THE[SPC5]
FUNCTION KEYS."
 820 PRINT"[BLUE,DOWN,SPC]THE
 AIM IS TO FIND THE 5 MINES
 IN AS[SPC4]FEW GOES AS POSSI
BLE."
 830 PRINT" EACH MARK ON THE
 PERIMETER INCREASES[SPC4]
YOUR SCORE BY 10 POINTS."
 840 PRINT"[DOWN,SPC]FOR EACH
 MINE POSITION THAT YOU GET
[SPC5]WRONG, YOUR SCORE IS";
```



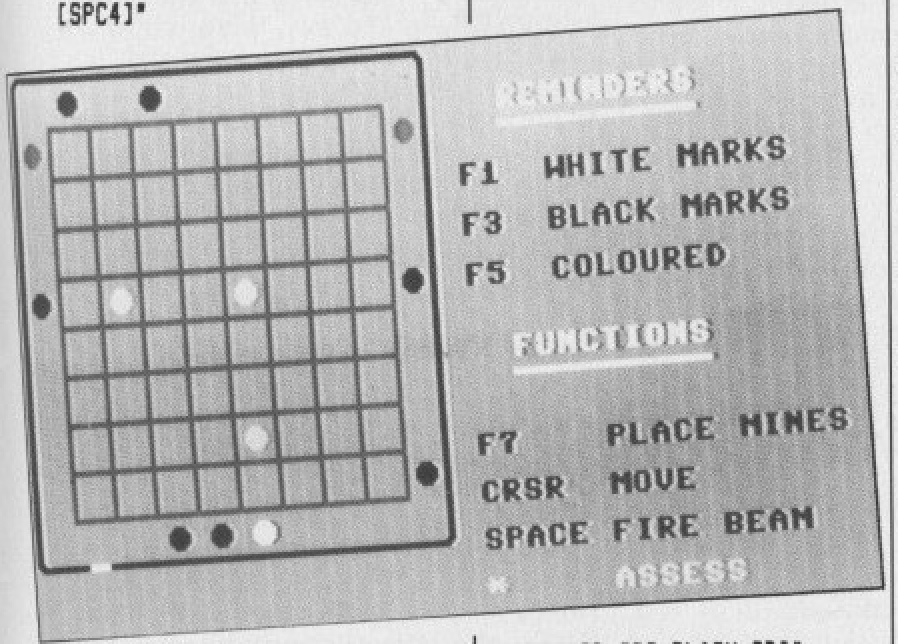

```
 850 PRINT" INCREASED BY 50
[SPC4]POINTS."
 860 PRINT:PRINT:PRINT"[SPC,
BLACK]YOUR BRAIN CELLS HAVE
 MY SYMPATHY"
 870 PRINT" FOR WHAT THEY ARE
 ABOUT TO ENDURE."
 880 PRINT:PRINT"[SPC7,RVSON]
PRESS SPACE TO PLAY[RVSOFF]"
 890 GET K$:IF K$<>" "THEN 890
 900 POKE 56578,PEEK(56578)OR
 1:POKE 56576,(PEEK(56576)AND
 252)OR 1
 910 POKE 648,136:POKE 53272,
32
 920 REM CLEAR GRID AND POSIT
ION MINES
 930 GOSUB 2730:MI=0:MC=2:SR=0
:RN=RND(TI)
 940 FOR X=1 TO 10
:FOR Y=1 TO 10:G%(X,Y)=0
:GP%(X,Y)=15:NEXT Y,X
 950 FOR L=1 TO 5
 960 X=INT(RND(1)*7)+2
:Y=INT(RND(0)*7)+2
 970 IF G%(X,Y)=1 THEN 960
 980 G%(X,Y)=1:NEXT
 990 GOTO 1020
 1000 IF(X=1)OR(X=10)THEN PRI
NT"[BLACK,LEFT,SB]":RETURN
 1010 PRINT"[BLACK,LEFT,SC]"
:RETURN
 1020 X=2:Y=1:GOSUB 1370
 1030 PRINT"[HOME,DOWN20,
RIGHT3,WHITE,SC]";
1040 GET K$:IF K$=""THEN 1040
1050 IF K$="[RIGHT]"THEN 1140
1060 IF K$="[DOWN]"THEN 1270
1070 IF K$=" "THEN GOSUB 1910
:GOTO 1020
 1080 IF K$="[F1]"THEN GOSUB
2900:GOSUB 2670:GOTO 1020
 1090 IF K$="[F3]"THEN GOSUB
3000:GOSUB 2670:GOTO 1020
 1100 IF K$="[F5]"THEN GOSUB
3080:GOSUB 2670:GOTO 1020
 1110 IF K$="[F7]"THEN GOSUB
1480:GOTO 1020
 1120 IF K$="*"THEN 2350
 1130 GOTO 1040
 1140 GOSUB 2570
 1150 IF(X=9)AND(Y=1)THEN PRI
NT"[LEFT,BLACK,SC,RIGHT2,UP3,
WHITE,SB]";:X=10:Y=2:GOTO 1040
 1160 IF(X=10)AND(Y=9)THEN PR
INT"[LEFT,BLACK,SB,LEFT4,UP3,
WHITE,SC]";:X=9:Y=10:GOTO 1040
 1170 IF(X=2)AND(Y=10)THEN PR
INT"[LEFT,BLACK,SC,LEFT4,
DOWN3,WHITE,SB]";:X=1:Y=9
:GOTO 1040
 1180 IF(X=1)AND(Y=2)THEN PRI
NT"[LEFT,BLACK,SB,DOWN3,
RIGHT2,WHITE,SC]";:X=2:Y=1
:GOTO 1040
 1190 IF X=1 THEN GOSUB 1260
:GOTO 1040
 1200 IF X=10 THEN GOSUB 1250
:GOTO 1040
 1210 IF Y=1 THEN GOSUB 1230
:GOTO 1040
 1220 IF Y=10 THEN GOSUB 1240
:GOTO 1040
 1230 PRINT"[LEFT,BLACK,SC,
RIGHT,WHITE,SC]";:X=X+1:RETURN
 1240 PRINT"[LEFT,BLACK,SC,
LEFT3,WHITE,SC]";:X=X-1:RETURN
 1250 PRINT"[LEFT,BLACK,SB,
```

```
UP2,LEFT,WHITE,SB]";:Y=Y+1
:RETURN
 1260 PRINT"[LEFT,BLACK,SB,
DOWN2,LEFT,WHITE,SB]";:Y=Y-1
:RETURN
 1270 GOSUB 2570
 1280 IF(X=2)AND(Y=1)THEN PRI
NT"[LEFT,BLACK,SC,LEFT4,UP3,
WHITE,SB]";:X=1:Y=2:GOTO 1040
 1290 IF(X=1)AND(Y=9)THEN PRI
NT"[LEFT,BLACK,SB,UP3,RIGHT2,
WHITE,SC]";:X=2:Y=10:GOTO 1040
 1300 IF(X=9)AND(Y=10)THEN PR
INT"[LEFT,BLACK,SC,RIGHT2,
DOWN3,WHITE,SB]";:X=10:Y=9
:GOTO 1040
 1310 IF(X=10)AND(Y=2)THEN PR
INT"[LEFT,BLACK,SB,LEFT4,
DOWN3,WHITE,SC]";:X=9:Y=1
:GOTO 1040
 1320 IF X=1 THEN GOSUB 1250
:GOTO 1040
 1330 IF X=10 THEN GOSUB 1260
:GOTO 1040
 1340 IF Y=1 THEN GOSUB 1240
:GOTO 1040
 1350 IF Y=10 THEN GOSUB 1230
:GOTO 1040
 1360 GOTO 1040
 1370 PRINT"[HOME]"TAB(24)"
[DOWN2,WHITE]REMINDERS"
:PRINT TAB(24)"[SC9]"
 1380 PRINT TAB(22)"[DOWN,
BLACK]F1[SPC2,BLUE]
WHITE MARKS "
 1390 PRINT TAB(22)"[DOWN,
BLACK]F3[SPC2,BLUE]
BLACK MARKS"
 1400 PRINT TAB(22)"[DOWN,
BLACK]F5[SPC2,BLUE]COLOURED
[SPC3]"
 1410 PRINT TAB(22)"[DOWN2,
WHITE,SPC2]FUNCTIONS"
:PRINT TAB(22)"[SPC2,SC9]"
 1420 PRINT TAB(22)"[SPC8]"
 1430 PRINT TAB(22)"[DOWN,
BLACK]F7[SPC4,BLUE]
PLACE MINES"
 1440 PRINT TAB(22)"[DOWN,
BLACK]CRSR[SPC2,BLUE]MOVE"
 1450 PRINT TAB(22)"[DOWN,
BLACK]SPACE[SPC,BLUE]
FIRE BEAM"
 1460 PRINT TAB(22)"[DOWN,
YELLOW]$[SPC5]ASSESS"
 1470 RETURN
 1480 GOSUB 1000
 1490 PRINT"[HOME]"TAB(24)"
[DOWN2,SPC9]":PRINT TAB(24)"
[SPC9]"
 1500 PRINT TAB(22)"[DOWN,
BLACK]USE CRSR KEYS TO"
 1510 PRINT TAB(22)"[DOWN]
MOVE AROUND THE "
 1520 PRINT TAB(22)"[DOWN]
GRID.[SPC11]"
 1530 PRINT TAB(22)"[DOWN2,
MAGENTA]PRESS[SPC,WHITE]+
[MAGENTA,SPC]TO ":PRINT TAB(2
2)"[SPC14]"
 1540 PRINT TAB(22)"PLACE OR"
 1550 PRINT TAB(22)"[DOWN]
REMOVE MINES.[SPC4]"
 1560 PRINT TAB(22)"[DOWN,
SPC11]"
 1570 PRINT TAB(22)"[DOWN,
BLUE]PRESS SPACE[SPC5]"
 1580 PRINT TAB(22)"[DOWN]TO
RETURN.[SPC2]"
 1590 X=2:Y=2:PRINT"[WHITE,
HOME,DOWN17,RIGHT3]'";
 1600 GET K$:IF K$=""THEN 1600
```




```
 1610 IF K$=" "THEN 1880
 1620 IF K$="[UP]"THEN 1680
 1630 IF K$="[RIGHT]"THEN 1720
 1640 IF K$="[DOWN]"THEN 1760
 1650 IF K$="[LEFT]"THEN 1800
 1660 IF K$="+"THEN 1840
 1670 GOTO 1600
 1680 IF Y=9 THEN 1600
 1690 GOSUB 2570:PRINT"[WHITE,
LEFT,SPC,UP2,LEFT]'";
 1700 IF GP%(X,Y)<>15 THEN PO
KE SC(X,Y),39:POKE SC(X,Y)+CO,
7
 1710 Y=Y+1:GOTO 1600
 1720 IF X=9 THEN 1600
 1730 GOSUB 2570:PRINT"[WHITE,
LEFT,SPC,RIGHT]'";
 1740 IF GP%(X,Y)<>15 THEN PO
KE SC(X,Y),39:POKE SC(X,Y)+CO,
7
 1750 X=X+1:GOTO 1600
 1760 IF Y=2 THEN 1600
 1770 GOSUB 2570:PRINT"[WHITE,
LEFT,SPC,DOWN2,LEFT]'";
 1780 IF GP%(X,Y)<>15 THEN PO
KE SC(X,Y),39:POKE SC(X,Y)+CO,
7
 1790 Y=Y-1:GOTO 1600
 1800 IF X=2 THEN 1600
 1810 GOSUB 2570:PRINT"[WHITE,
LEFT,SPC,LEFT3]'";
 1820 IF GP%(X,Y)<>15 THEN PO
KE SC(X,Y),39:POKE SC(X,Y)+CO,
7
 1830 X=X-1:GOTO 1600
 1840 IF(GP%(X,Y)=15)AND(MI=5
)THEN 1600
 1850 GOSUB 2590
 1860 IF GP%(X,Y)=15 THEN GP%
(X,Y)=7:MI=MI+1:GOTO 1600
 1870 GP%(X,Y)=15:MI=MI-1
:GOTO 1600
 1880 PRINT"[LEFT,SPC]"
 1890 IF GP%(X,Y)<>15 THEN PO
KE SC(X,Y),39:POKE SC(X,Y)+CO,
7
 1900 RETURN
 1910 GOSUB 1000:IF GP%(X,
Y)<>15 THEN RETURN
 1920 GOSUB 2590:X1=X:Y1=Y
 1930 POKE SC(X,Y),39
:POKE SC(X,Y)+CO,MC
:GP%(X,Y)=MC
 1940 IF X=10 THEN 2050
 1950 IF Y=1 THEN 2130
 1960 IF Y=10 THEN 2210
 1970 IF G%(X+1,Y)=1 THEN 2290
 1980 IF(G%(X+1,Y+1)=1)OR(G%(
X+1,Y-1)=1)THEN 2300
 1990 X=X+1:IF X=10 THEN 2310
 2000 IF G%(X+1,Y)=1 THEN 2290
 2010 IF(G%(X+1,Y+1)=1)AND(G%
(X+1,Y-1)=1)THEN 2300
 2020 IF G%(X+1,Y+1)=1 THEN 2
230
 2030 IF G%(X+1,Y-1)=1 THEN 2
150
 2040 GOTO 1990
 2050 IF G%(X-1,Y)=1 THEN 2290
 2060 IF(G%(X-1,Y+1)=1)OR(G%(
X-1,Y-1)=1)THEN 2300
 2070 X=X-1:IF X=1 THEN 2310
 2080 IF G%(X-1,Y)=1 THEN 2290
 2090 IF(G%(X-1,Y+1)=1)AND(G%
(X-1,Y-1)=1)THEN 2300
 2100 IF G%(X-1,Y+1)=1 THEN 2
230
 2110 IF G%(X-1,Y-1)=1 THEN 2
150
 2120 GOTO 2070
 2130 IF G%(X,Y+1)=1 THEN 2290
 2140 IF(G%(X+1,Y+1)=1)OR(G%(
X-1,Y+1)=1)THEN 2300
 2150 Y=Y+1:IF Y=10 THEN 2310
 2160 IF G%(X,Y+1)=1 THEN 2290
 2170 IF(G%(X-1,Y+1)=1)AND(G%
(X+1,Y+1)=1)THEN 2300
 2180 IF G%(X-1,Y+1)=1 THEN 1
990
 2190 IF G%(X+1,Y+1)=1 THEN 2
070
 2200 GOTO 2150
 2210 IF G%(X,Y-1)=1 THEN 2290
 2220 IF(G%(X+1,Y-1)=1)OR(G%(
X-1,Y-1)=1)THEN 2300
 2230 Y=Y-1:IF Y=1 THEN 2310
 2240 IF G%(X,Y-1)=1 THEN 2290
 2250 IF(G%(X-1,Y-1)=1)AND(G%
(X+1,Y-1)=1)THEN 2300
 2260 IF G%(X-1,Y-1)=1 THEN 1
990
 2270 IF G%(X+1,Y-1)=1 THEN 2
070
 2280 GOTO 2230
 2290 POKE SC(X1,Y1)+CO,0
:GP%(X1,Y1)=0:SR=SR+10:RETURN
 2300 POKE SC(X1,Y1)+CO,1
:GP%(X1,Y1)=1:SR=SR+10:RETURN
 2310 POKE SC(X,Y),39
:POKE SC(X,Y)+CO,MC
 2320 GP%(X,Y)=MC:SR=SR+20
 2330 MC=MC+1:IF MC=15 THEN M
C=2
 2340 RETURN
 2350 GOSUB 1000:IF MI<>5 THE
N 1020
 2360 FOR X=2 TO 9
:FOR Y=2 TO 9
 2370 IF G%(X,Y)<>1 THEN 2410
 2380 POKE SC(X,Y),39
 2390 IF GP%(X,Y)=15 THEN SR=
```

```
SR+50:POKE SC(X,Y)+CO,2
:GOSUB 2640:GOTO 2410
 2400 POKE SC(X,Y)+CO,4
:GOSUB 2610
 2410 NEXT Y,X
 2420 IF HS=0 OR SR<HS THEN H
S=SR
 2430 PRINT"[HOME]"TAB(24)"
[DOWN2,SPC9]":PRINT TAB(24)"
[SPC9]"
 2440 PRINT TAB(22)"[DOWN,
BLUE,SPC3]BEST[SPC2]SCORE
[SPC3]"
 2450 PRINT TAB(22)"[DOWN,
SPC16]":PRINT TAB(24)"[UP]";HS
 2460 PRINT TAB(22)"[DOWN,
SPC15]"
 2470 PRINT TAB(22)"[DOWN2,
SPC11]":PRINT TAB(22)"[SPC11]"
 2480 PRINT TAB(22)"[SPC8]"
 2490 PRINT TAB(22)"[DOWN,
GREEN,SPC3]YOUR[SPC2]SCORE
[SPC4]"
```




```
 2500 PRINT TAB(22)"[DOWN,
SPC10]":PRINT TAB(22)"[UP2,
SPC11,LEFT9]";SR
 2510 PRINT TAB(22)"[DOWN,
SPC15]"
 2520 PRINT TAB(22)"[DOWN,
YELLOW,SPC3]ANOTHER GO? "
 2530 GET K$:IF K$=""THEN 2530
 2540 IF K$="Y"THEN 930
 2550 IF K$<>"N"THEN 2530
 2560 SYS 64738
 2570 POKE W1,17:POKE H1,205
:POKE L1,133:POKE W1,16
 2580 RETURN
 2590 POKE W2,33:POKE H2,108
:POKE L2,223:POKE W2,32
 2600 RETURN
 2610 POKE W3,17:POKE H3,57
:POKE L3,172
 2620 FOR L=1 TO 250:NEXT
 2630 POKE W3,16:RETURN
 2640 POKE W3,33:POKE H3,4
:POKE L3,73
 2650 FOR L=1 TO 250:NEXT
 2660 POKE W3,32:RETURN
 2670 GOSUB 2730
 2680 FOR X=1 TO 10
:FOR Y=1 TO 10
 2690 IF GP%(X,Y)=15 THEN 2710
 2700 POKE SC(X,Y),39
:POKE SC(X,Y)+CO,GP%(X,Y)
 2710 NEXT Y,X:RETURN
 2720 REM PRINT GRID
 2730 PRINT"[CLEAR,BLACK,SU,
SC19,SI]"
 2740 PRINT"[SB,SPC19,SB]"
 2750 PRINT"[SB,SPC,C5,CA,SC,
CR,SC,CR,SC,CR,SC,CR,SC,CR,SC,
CR,SC,CR,SC,CS,BLACK,SPC,SB]"
 2760 FOR L=1 TO 7
 2770 PRINT"[SB,SPC,C5,SB]╯
[SB]╯[SB]╯[SB]╯[SB]╯[SB]╯[SB]
╯[SB]╯[SB,SPC,BLACK,SB]"
 2780 PRINT"[SB,SPC,C5,CQ,SC,
S+,SC,S+,SC,S+,SC,S+,SC,S+,SC,
S+,SC,S+,SC,CW,SPC,BLACK,SB]"
 2790 NEXT
 2800 PRINT"[SB,SPC,C5,SB]╯
[SB]╯[SB]╯[SB]╯[SB]╯[SB]╯[SB]
╯[SB]╯[SB,SPC,BLACK,SB]"
 2810 PRINT"[SB,SPC,C5,CZ,SC,
CE,SC,CE,SC,CE,SC,CE,SC,CE,SC,
CE,SC,CE,SC,CX,SPC,BLACK,SB]"
 2820 PRINT"[SB,SPC19,SB]"
 2830 PRINT"[SJ,SC19,SK]"
 2840 RETURN
 2850 PRINT"[HOME,YELLOW,
DOWN5,RIGHT11]'[RIGHT3]'"
 2860 PRINT"[DOWN5,RIGHT17]'"
 2870 PRINT"[DOWN,RIGHT9]'"
 2880 PRINT"[DOWN3,RIGHT15]'"
 2890 RETURN
 2900 GOSUB 2730:GOSUB 2850
 2910 PRINT"[HOME,WHITE,DOWN7,
RIGHT13]$[DOWN,LEFT]][DOWN,
LEFT]][DOWN,LEFT]][DOWN,LEFT]]
[DOWN,LEFT]][DOWN,LEFT]][DOWN,
LEFT]]"
 2920 PRINT"[RIGHT11,UP-ARROW,
LEFT-ARROW]$"
 2930 PRINT"[RIGHT11]][DOWN,
LEFT]\[DOWN2,LEFT]'";
 2940 PRINT"[RIGHT5]'[UP2,
LEFT][";
 2950 PRINT"[LEFT,UP8]%[RIGHT]
'";
 2960 PRINT"[DOWN2,RIGHT4,
BLUE]PRESS SPACE"
 2970 PRINT TAB(24)"[DOWN]TO
RETURN."
 2980 GET K$:IF K$<>" "THEN 2
980
 2990 RETURN
 3000 GOSUB 2730:GOSUB 2850
 3010 PRINT"[HOME,BLACK,DOWN7,
RIGHT]'[RIGHT,WHITE,SC6,SI,
DOWN,LEFT,SB,DOWN,LEFT,SB,
DOWN,LEFT,SB,DOWN,LEFT,CE]"
 3020 PRINT"[DOWN,RIGHT,BLACK]
'[RIGHT,WHITE,SC4,CW]"
 3030 PRINT"[BLACK,DOWN5,
RIGHT15]'[UP,LEFT,WHITE,CR]";
 3040 PRINT"[UP7,RIGHT8,BLUE]
PRESS SPACE"
 3050 PRINT TAB(24)"[DOWN]TO
RETURN."
 3060 GET K$:IF K$<>" "THEN 3
060
 3070 RETURN
 3080 GOSUB 2730:GOSUB 2850
 3090 PRINT"[HOME,BLUE,RIGHT7,
DOWN]'[WHITE,DOWN2,LEFT,SB,
DOWN,LEFT,SB,DOWN,LEFT,SB,
DOWN,LEFT,SB,DOWN,LEFT,SB,
DOWN,LEFT,SB,DOWN,LEFT,SB,
DOWN,LEFT,SB,DOWN,LEFT,SK]
"
 3100 PRINT"[UP,RIGHT,BLUE]'
[WHITE,RIGHT,SC4]"
 3110 PRINT"[DOWN7,RIGHT3,
GREEN]'[WHITE,UP2,LEFT,SB,UP,
LEFT,SB,UP,LEFT,SB,UP,LEFT,SB,
UP,LEFT,SB,UP,LEFT,SB,UP,LEFT,
S+,UP,LEFT,SB,UP,LEFT,SB,UP,
LEFT,SB,UP,LEFT,SB,UP,LEFT,SB,
UP,LEFT,SB,UP,LEFT,SB,UP,LEFT,
SB,UP2,LEFT,GREEN]'"
 3120 PRINT TAB(17)"[MAGENTA,
UP]'[DOWN2,LEFT,WHITE,SJ,
RIGHT,MAGENTA]'"
 3130 PRINT TAB(24)"[DOWN7,
BLUE]PRESS SPACE"
 3140 PRINT TAB(24)"[DOWN]TO
RETURN."
 3150 GET K$:IF K$<>" "THEN 3
150
 3160 RETURN
 3170 PRINT"[HOME,MAGENTA,
DOWN5,RIGHT3]G[RIGHT]R[RIGHT]
I[RIGHT]D"
 3180 PRINT"[DOWN,RIGHT3]S
[RIGHT]E[RIGHT]A[RIGHT]R
[RIGHT]C[RIGHT]H"
 3190 PRINT"[C1,DOWN3,RIGHT5]
B[RIGHT]Y"
 3200 PRINT"[BLUE,DOWN3,
RIGHT3]D[RIGHT]E[RIGHT]R
[RIGHT]E[RIGHT]K"
 3210 PRINT"[DOWN,RIGHT3]W
[RIGHT]A[RIGHT]L[RIGHT]D
[RIGHT]R[RIGHT]O[RIGHT]N
[RIGHT]."
 3220 PRINT"[HOME]"TAB(23)"
[DOWN10,WHITE]IS YOUR BRAIN"
 3230 PRINT TAB(23)"[DOWN]UP
TO THE"
 3240 PRINT TAB(23)"[DOWN]
CHALLENGE?"
 3250 RETURN
 3260 REM USER DEFINED GRAPHI
CS DATA
 3270 DATA 120,132,132,132,
132,159,142,132
 3280 DATA 132,132,132,132,
132,159,142,132
 3290 DATA 132,132,132,132,
132,132,132,132
 3300 DATA 63,64,128,128,128,
131,132,132
 3310 DATA 255,0,0,0,0,255,0,0
 3320 DATA 4,4,4,4,8,240,0,0
 3330 DATA 120,132,132,132,
132,132,132,132
 3340 DATA 127,128,128,132,
134,127,6,4
 3350 DATA 127,128,128,128,
128,127,0,0
 3360 DATA 60,126,255,255,255,
255,126,60
```

Stuart Cooke opted out of the rat race for a while to look at the MS2000 mouse.

Say Cheese

EVER SINCE COMPUTERS WERE invented people have been trying to find some way of making them easier to use so that John Smith can sit down at the computer terminal and start work without too much instruction.

One day some bright spark invented the mouse, so called because it was a small box that connected to the computer by a long lead which looks rather like a mouse's tail. Apple used a mouse to its benefit when it launched the Macintosh computer. All software designed for this machine is under control of the mouse. No longer do you have to enter long instructions you simply have to select one of the pull down menus with the mouse and make the appropriate choice of command.

Now Wigmore House has launched the MS2000 mouse so that Commodore owners can get a look at these exciting devices.

First Impressions

The MS2000 comes complete with an 'advanced graphics' programs and a 13 page photocopied manual. The mouse itself is quite small and very well constructed. Examining the underside of the mouse reveals the rubber coated ball. It is this ball that moves when the mouse is dragged around your desk. The rubber coating gives good traction on most surfaces. The ball is easily removed by means of a sliding panel. Removal of the ball is essential from time to time for cleaning as when moving around the desk the ball is bound to get covered in some rubbish.

Documentation

The manual is adequate and the only problem is that a large amount of what I consider to be necessary information is missing.

How to load the software is covered in detail and there is a general description of how to use the mouse.

Most of the manual is given over to an explanation of the graphics package. Each available command is dealt with individually, each command being given a short but useful description.

What is missing from the manual is a detailed description of the mouse operation. No mention is made of how you can use the mouse in your own programs, how to detect the position of the mouse or check whether either of the two buttons are pressed. Surely this is a serious omission as many people will want to write their own programs that use the mouse.

Moving the cursor to an icon, a small picture, on the screen and pressing one of the buttons will cause a specific action to take place. For example moving the pointer to the magnifying glass will cause an area of the screen to be enlarged.

Software

As previously mentioned the software supplied with the mouse is a fairly comprehensive graphics package. The mouse is used not only to select options from the menu but also to draw on the high resolution screen.

In Use

The first thing that you notice about the package, when you come to use it, is a certain lack of 'professionalism'. Firstly, there is no turbo loader on the graphics package, though it is quite short and doesn't take too long to load. Secondly, the program does not auto run, you have to type SYS 4096 after loading. It's a simple matter to get a program to auto run thus making it easier to get going.

Mice may be extremely easy items to use but they do have their drawbacks. If like me, you only see the wood on your desk once a year when you have a mass tidy, you'll soon run into problems. You need quite a bit of desk space to use the mouse.

Basically, the mouse is used to move a pointer on screen, every movement of the mouse being mimicked by the pointer. Therefore, to move the cursor you simply move the mouse across the desk, or in my case across the books, letters, cassettes and coffee cups. No doubt you understand the problem.

The drawing package has three different menus. Because of lack of space on the screen, only one of these can be seen at any one time. To select the menus the pointer is simply moved to an icon that looks like a rabbit, pressing the button will then cause each menu to be displayed in turn. Yes, that's right a rabbit. Well the program is called CHEESE and is controlled by a mouse so why not have a rabbit? Oh, by the way, there is also an undo function in case you make any mistakes. Undo erases the last thing done to the graphics screen. What I can't figure out is why this looks like a cat.

Because the program is so comprehensive it is probably worth mentioning each function in turn.

Main Menu

The main menu consists of three icons: The previous mentioned undo and menu select icons, and one to select the tile pattern. Whenever you fill in an area on the screen it is filled with this pattern. There are 32 different tile options ranging from a solid to ones that look like building bricks. The inkpot icon and pencil icon are also always available. These are used to select the border and pen colour respectively. An icon that looks like a canvas is used to change the background colour.

Now on to the other functions.

It is possible to draw straight lines with the straight line function. The mouse is moved to one end of the line, the button pressed, and the mouse again moved. The line then follows behind the mouse drawing a straight line from its starting point. Freehand continuous and dotted drawing are also provided. The thickness of the line that you draw can also be changed by the pencil icon.

It is possible to draw circles and rectangles and these can be either outline of filled. Remember, if you select fill, then the current tile pattern will be used. A picture of two icecream cones is used to select the palate. This allows you to change one colour on screen to another.

Not only is it possible to fill in circles and boxes but it is possible to fill an irregular area on screen with the paint brush icon. Again this uses the tile patterns. Not only can you fill areas with a tile pattern but you can also use a spray can effect to fill an area with dots, the longer you leave the can over a specific area the more dots fill it, just like the ones used to paint cars.

The actual drawing area that can be seen on the screen at any one time is smaller than the actual canvas. The scroll icon is used to move the canvas up and down so that you can work on the whole area.

Rectangular areas of the canvas can be copied. The size of the rectangle is left up to you. It is also possible to reverse rectangular areas on the screen. You can flip the rectangle either horizonally or vertically. A mirror function is also available. This will allow you to mirror whatever you do across horizontal, vertical and diagonal axis.

When finished you are able to save your pictures on to tape or get a printout on a Commodore compatible printer.

No provision is made to save the pictures to disk, though I am told that a cartridge version of the software will soon be available and will have a disk facility in it.

A Little Extra

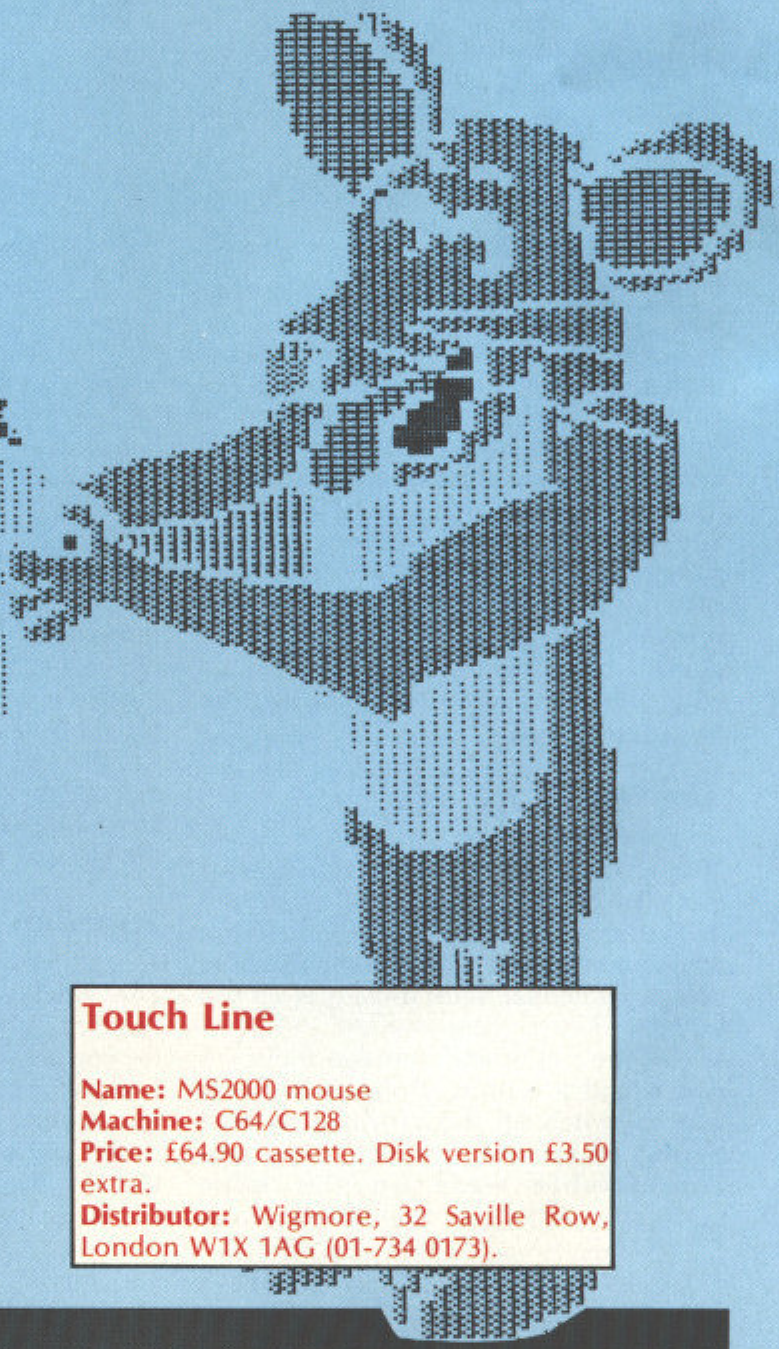
A small section at the rear of the manual explains how you can make the mouse emulate a joystick by turning on the computer while a button is held down on the mouse. This will allow you to use the mouse with any software which uses a joystick. This is very handy, though I found it wasn't too good for playing games with and I did come across a small problem with this. When you power on your C64 with the mouse attached, the mouse continuously sends its position to the C64. Because some of the joystick positions cause characters to be printed on screen you find that a continuous stream of spurious characters appear on screen making it impossible to type in anything on the keyboard, essential if you want to load a game.

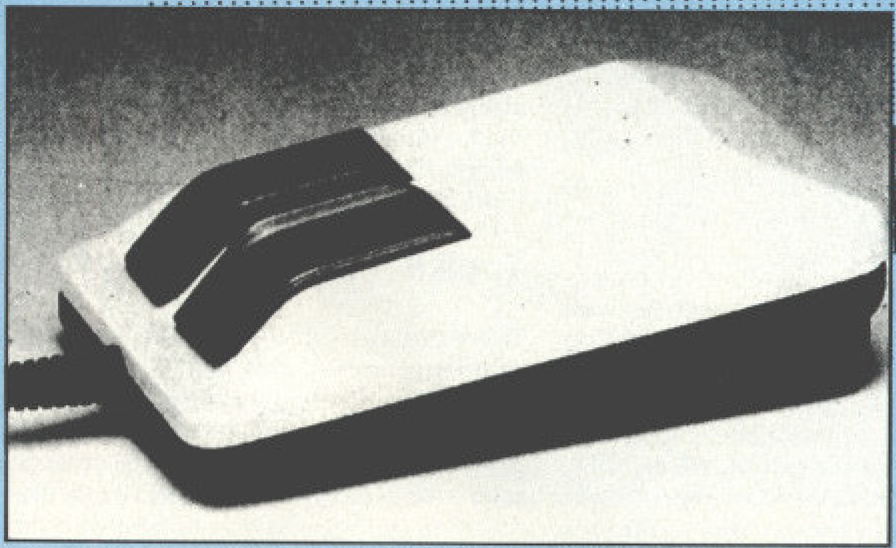
Verdict

Even though I have mentioned a couple of gripes about the MS2000 it cannot be denied that it would make an excellent addition to any C64. The construction of the mouse is excellent and if you are into graphics then the package is very good.

It's also great fun.





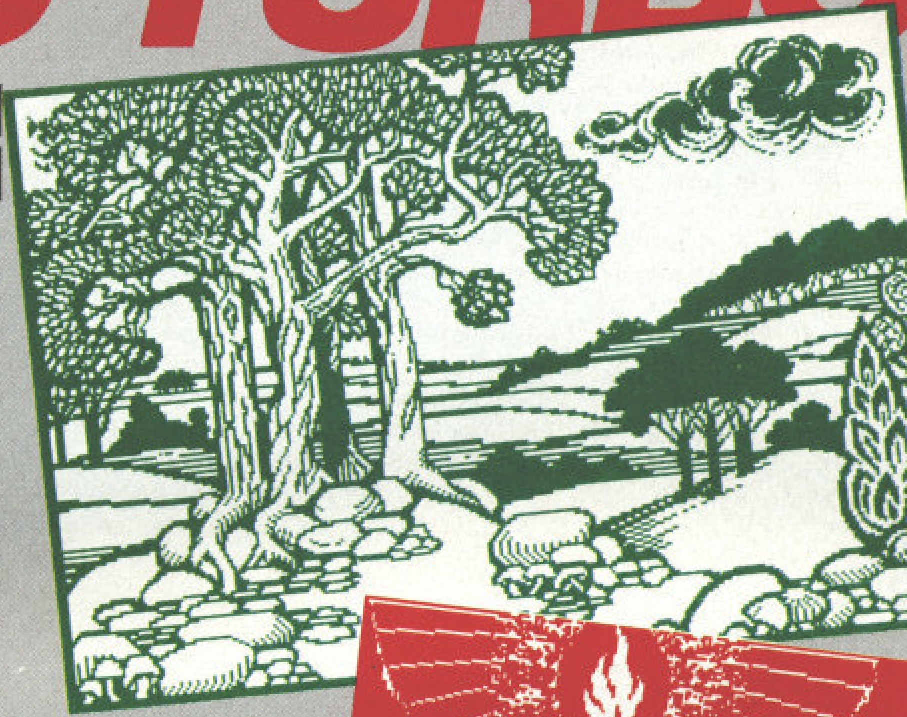


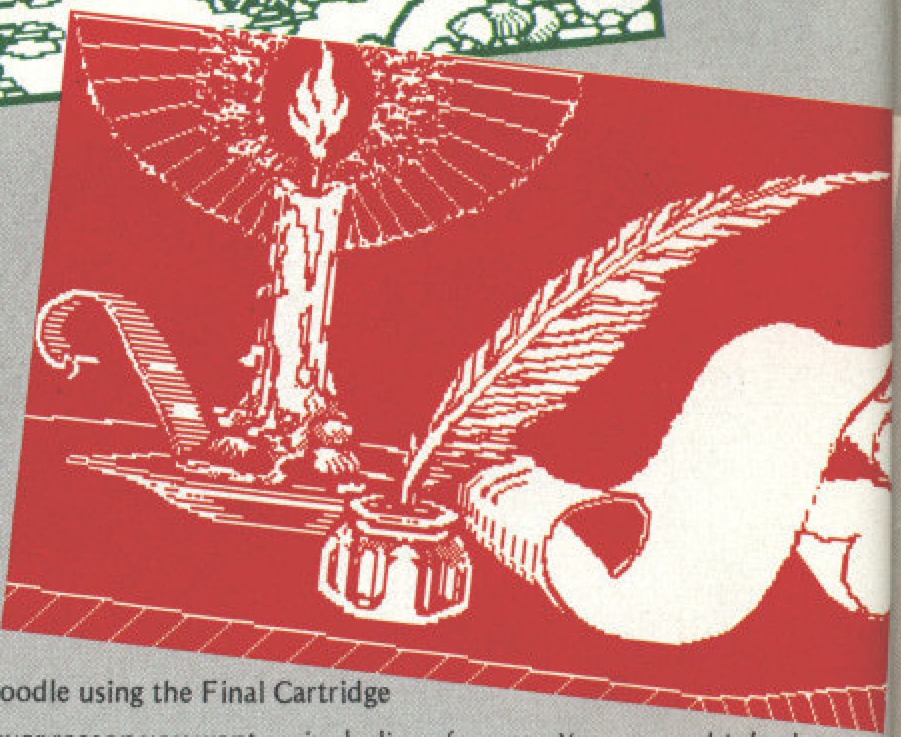
Touch Line

Name: MS2000 mouse
Machine: C64/C128
Price: £64.90 cassette. Disk version £3.50 extra.
Distributor: Wigmore, 32 Saville Row, London W1X 1AG (01-734 0173).

A TALE OF TWO TURBOS

Dave Crisp reviews two fast loader cartridges.





Screen dump from doodle using the Final Cartridge

1541 IS THE NUMBER OF MINUTES I usually expect a program to load on a Commodore disk drive. Fortunately things have been getting better (slowly).

First came software turbo-loaders, such as Warp 5, and individual loaders produced by software houses for their own use. Now we are in the best stages of cartridge based turbo loaders.

Here, I have written about just two from the half-dozen good ones that are now available. One is comparatively low priced, the other relatively high priced but neither are simple turbo-loaders.

Both offer features which, I feel, make them good value for money and because of that a direct comparison would be unfair so they must be looked at as different add-ons with only fast loading in common.

Limitations

One thing that I have not seen on any fast-loader is the ability to fast load everything. This is in many cases due to confliction of memory, where the fast loader is RAM based, or due to the fact that some software uses its own load routines. In the early days of fast loading, any attempt to fast load software such as *Easy-Script* and *Superbase* resulted in the machine hanging up. But from what I have seen recently it would seem that most loaders now revert to normal loading if there is going to be problems. This prevents much plug pulling and switch switching in order to get going again.

The Final Cartridge

This is much more than a fast loader. It is a tool kit, a printer interface, and a monitor. At first look it seems quite expensive but when you consider what the above would cost as individual items it really is a good buy.

On the top of the cartridge there is a switch and a button. The switch allows you to switch off the cartridge without having to remove it which does save considerable wear on the edge connector, and the button allows you to reset the 64 for whatever reason you want. I have read that pressing "reset" and "Q" together results in even un-resetable programs resetting. Very useful at times. I suspect that my manual was a pre-release manual as I could find no reference to this fact though I must say that, on the whole, the manual was still very good.

Function Keys

The Final Cartridge has been so well thought out that the 'new' operating system provides pre-defines those near useless function keys. As soon as you plug in, pressing the function keys give you single key LIST, MONITOR, RUN, OFF, DLOAD, DSAVE, CATALOG, and finally F8 gives you various disk routines including format. You may think that having these keys pre-defined will interfere with anything that a program may try to do with the keys. That did occur to me but not until after I realised that I had already been using programs that defined the keys for their own use anyway, such as *Micro-Simplex*. With all the software I tried I had no problems whatsoever.

Toolkit

There are many different kinds of toolkits offering graphics aids, audio aids and so on. This one is simply a programmer's aid which helps speed up and simplify programming. Because of this you can save a finished program and run it on a machine without having to have the car-

tridge in place. Using toolkits which offer special commands can often cause problems, as running the program requires the presence of the toolkit. Commands supported by the final cartridge are:

1. RENUMBER – including GOTOS and GOSUBS
2. APPEND – loads a second program on to the end of a program resident in RAM.
3. AUTO – automatically offers line numbers when writing a Basic program. The start number and increment are entered in the form AUTO 10,10 and line numbers 10,20,30,40 and so on are added automatically.
6. HELP – when a program stops due to syntax error typing HELP will present the line number on screen and show you exactly where the problem occurred.
5. FIND – search through a program and displays the line numbers of any line containing the target word. e.g. FIND PRINT would display every line containing the command PRINT.
6. DEL – used in the same format as AUTO, DEL will delete any line numbers between those specified. Useful in conjunction with RENUMBER as it makes it easy to move sub-routines around.
7. OLD – if you have ever typed NEW and then realised you had forgotten to save your program simply type OLD and it reappears. Saves much hair-tearing and computer hitting.
8. LIST – this is a simple listing command. Will list some programs that cannot otherwise be listed.

The rest of the toolkit commands are concerned with the Disk Operating system.

1. CATALOG – displays on screen the catalog of a disk without overwriting the program in memory. Should have been on the 64 to start with.
2. DSAVE – TURBO'SAVES' a program to disk.
3. DLOAD – single key stroke version of LOAD,8,1 Simply type DLOAD PROGNAME.
4. DVERIFY – verify program written to disk.

Though not the most comprehensive toolkit does contain the most commonly used commands quite impressive.

Monitor

The monitor, built-in and accessed by pressing F2, is the same as the monitors found on the larger commands. Here the manual is a little presumptive and so if you are not familiar with a monitor a good book would help. Nice to have a good monitor immediately to hand.

Printerface

Used in conjunction with a Centronics lead the final cartridge provides an excellent Centronics interface. And with a good Epson-type printer more or less anything can be produced. Particularly nice is the screen dump facility.

Pressing RESET and The CONTROL key followed by a function key allows you to get a screen dump of a text or high resolution screen. The dump of the high resolution screen is faithful copy of whatever was on the screen. But it will not print out sprites. Using this I can now dump some of the graphics I have been unable to dump by any other means. Of course if you are doing a dump of commercial software it does remove the program from RAM and so you need to re-load to continue. But I can live with that.

Finally

I would buy the Final cartridge just on the strength of its other facilities. Having a fast loader is a bonus. There are some titles that it will not turbo-load but on the whole it copes with most. At least it does not hang up if you try to turbo.

Using the Final cartridge in conjunction with *Micro Simplex* was super. Anybody who uses Simplex will know that waiting for it to load its various functions is a little tedious. With The Final Cartridge the main program loads in 12 seconds – Sub programs in about six. To conclude, The Final Cartridge is by no means cheap. But imagine buying a cartridge based fast-loader, toolkit, printer interface and screen dump cartridge separately. I would be surprised if you had change from £80.

Touch Line

H and P Computers (YC) 9 Hornbeam-walk, Witham, Essex CM8 252.
Tel: 0376 511471
Price: £50

Trilogics GT Loader

The second cartridge I had the pleasure to use was the Trilogic Cartridge.

Certainly it does not have the range of facilities that the Final cartridge can boast but it costs about £30 less.

This too has an on/off switch and one version also has a reset switch. This idea could well spread to more cartridges as the damage cause to edge connectors by rough pushing in and pulling out of cartridge results in floppy results in floppy cartridges and thus constant hang-ups.

Essentially, Trilogic's cartridge is a fast-loader. Speed increases are certainly very noticeable and about as fast as the Final Cartridge. One nice touch is that any graphics which are supposed to be on screen, as the program loads, remain there – very reassuring. There is nothing more disconcerting than sitting in front of a blank screen when you know that under normal conditions you normally see flags, maidens, and skulls giving visual confirmation that at least something is going on.

Auto Switch Off

As it happens this cartridge also leaves the loading process alone if there are any problems and so loading reverts to normal, though I found most of the popular games loaded without any problems – even difficult multi-part games. I personally had no success with *Summer Games* but I suspect that this was due to mis-alignment of my drive heads rather than the cartridge. It may be worth pointing out here that if your drive is not in top physical condition, fast loaders seem to accentuate the problem. A drive in good condition should behave as normal. If you are having little success with fast loaders or gradually start to find that programs will not verify or load then head-alignment could be the problem.

Printing

A problem I did find when using the Trilogic cartridge along with a Commodore printer was that nothing happened. It would not even cough!

Trilogic acknowledges this and it is not exactly a fault. But if you are using a program which has to load from within the program and print out as well, you will need to switch the cartridge on and off between printing. Once you get used to it there is no problem, but it's rather a fiddle.

I used this cartridge with *Micro-Simplex* and it performed well. Loading times were much the same and it made using *Simplex* almost a pleasure. However, a program such as this accentuates its inability to print with the cartridge on.

Some disk commands are added with the cartridge and in most cases there is no need to suffix load commands with ",8. This is thoughtful and useful, and so the correct syntax for loading a program becomes LOAD"PROGNAME".

If a directory of the disk is loaded the programs are shown with colons where needed and so, to load a program, you simply cursor down to the relevant program and type 10 (L shifted o):.

If you load the greater sign, LOAD" " the error channel will be read and displayed, much better than open 15,8,15 and so on.

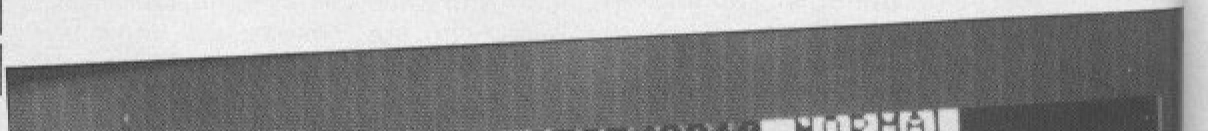
I liked this cartridge very much and if I had to buy one performance is better than many that cost more and since it has been released it has dropped in price.

Touch Line

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Well, I'm sure that we have all had problem before now. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

Here, at Your Commodore, we pride ourselves on the quality of listing that we print. Unfortunately, this usually means that they are also very long, thus taking longer to type in and leaving more room for errors. All of the listings in Your Commodore are taken straight from a printout of working programs, it is therefore very unusual for errors to appear in the magazine.

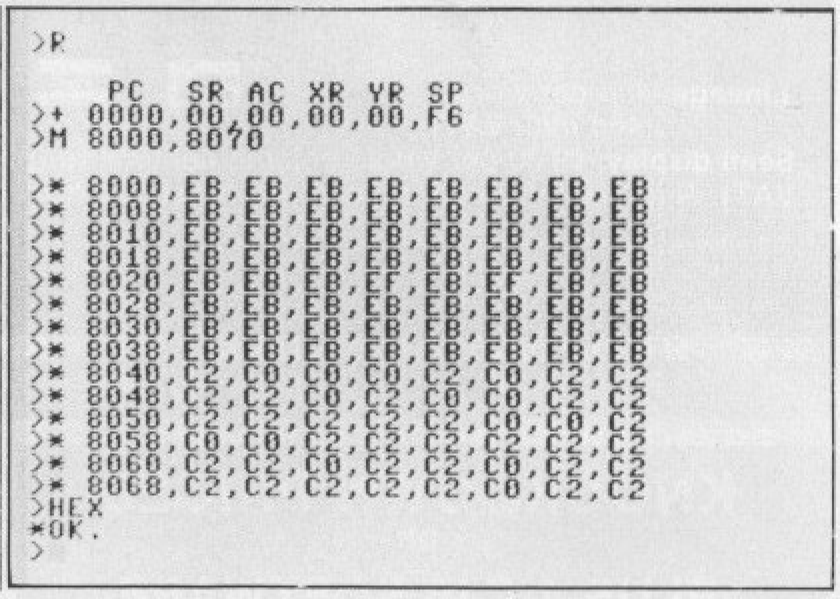
Because of the length of our programs we do get a large number of requests from readers who would like us to put specific programs on tape or disk for them. Obviously this is very time consuming and means that we can't spend as much time working on the magazine as we would like.

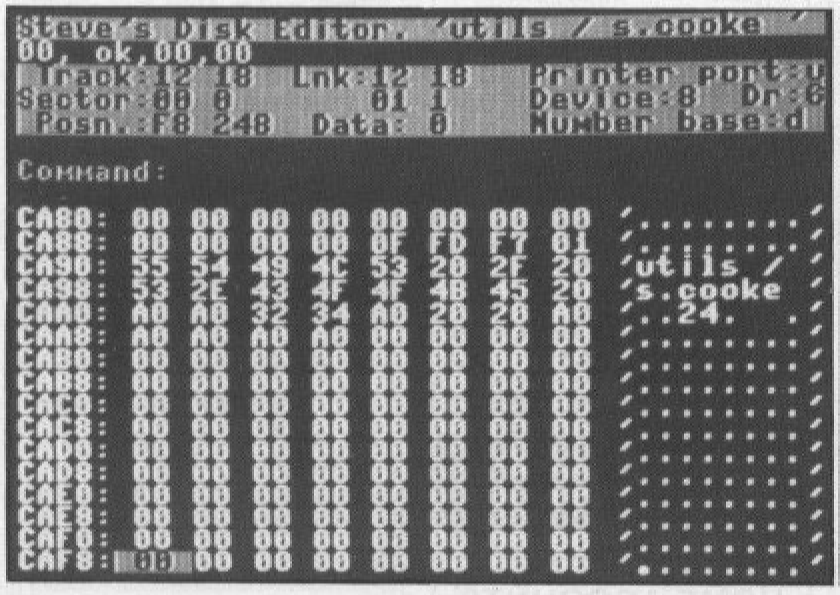
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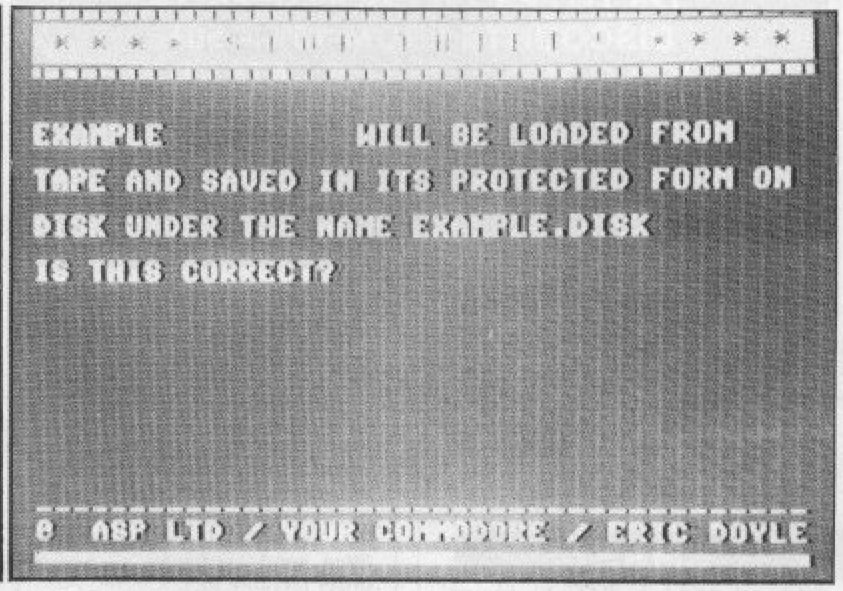
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This month we are not only going to make available most of the programs from this issue on cassette, we are also









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IN CHARACTER – Character Editor Nov'85
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DISK EDITOR – Jan'86

Unfortunately, instructions for these programs will not be available with the cassettes so you will have to refer to back issues of the magazine for them.

N.B. Only the programs for the C64/C128 will be available on cassette. We are looking at the C-16 and other machines at the moment and these may be available shortly.

The Music Master program will not be available on this month's cassette as it is only available from Wizard Development Ltd.

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